Appendix F

Part 1

DECLARATION FOR THE LEMON LANE LANDFILL RECORD OF DECISION AMENDMENT

SITE NAME AND LOCATION

The Lemon Lane Landfill site is located in Bloomington, Indiana. The National Superfund Database identification number is IND980794341. This Record of Decision (ROD) Amendment addresses contaminated water and sediment and is referred to as operable unit 2 and operable unit 3.

STATEMENT AND BASIS AND PURPOSE

This decision document presents the Selected Remedy for the Lemon Lane Landfill site, located in Bloomington, Indiana. This ROD Amendment presents the remedial action selected in accordance with Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and Section 300.435(c)(2)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This ROD Amendment will become part of the Administrative Record file per Section 300.825(a)(2) of the NCP. The Administrative Record, which contains the information on which selection of the remedial action was based, is available for review at the Monroe County Public Library in Bloomington, Indiana, as well as at the U.S. Environmental Protection Agency, Region 5 Superfund Records Center.

ASSESSMENT OF SITE

The response action selected in the ROD Amendment is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

DESCRIPTION OF THE SELECTED REMEDY

The Selected Remedy for the Lemon Lane Landfill site addresses groundwater and sediment contaminated by PCBs from springs located near the site. The source control operable unit one was completed in 2000 and addressed the principal threat waste through the excavation and off-site disposal and off-site incineration of high concentrations of PCB waste, including PCB oil-filled capacitors. The Selected Remedy for the site consists of expanding the treatment capacity of the current 1,000 gallon per minute (gpm) treatment plant through the implementation of a storage tank overflow treatment system that is capable of treating 5,000 gpm. The major components of the water operable unit consist of the following:

- Continue to treat Illinois Central Spring with the 1,000 gpm water treatment plant with 1.2 million gallons of stormwater storage.
- Expand the current water treatment plant by treating water which bypasses the 1,000 gpm treatment plant during large storm events by implementing a stormwater storage tank treatment system capable of treating 5,000 gpm. The system would consist of 8 Calgon

Model 12 or their equivalent carbon adsorption vessels each with 20,000 pounds of granular activated carbon. Based upon a treatability study, the stormwater storage system is expected to remove about 95% of the PCBs from the storage tanks. During the design phase, it may be determined that a different configuration may be an improvement to the 8 carbon adsorption vessels proposed and the storage tank overflow treatment system may be modified. The combined treatment systems will treat nearly 100% of the ICS spring water and treat 99.9% of the PCB mass from ICS.

- Install a new effluent line to handle all treated water and stormwater.
- Capture and treat Quarry B Spring and Rinker Spring at the ICS water treatment plant.
- An Operations and Maintenance Plan will be developed for the collection and treatment system and a monitoring program to monitor the effectiveness of the remedy.
- Implement a soil/sediment cleanup at the ICS emergence, swallowhole area and Quarry Springs area. The cleanup criteria is 1 ppm PCBs on average in drainage ways and 5 ppm PCBs in non-drainage ways. The amount of PCB contaminated material is 3,000 cubic yards and this will be disposed of in an off-site permitted landfill. Final volumes will be determined based upon a pre-design sampling event.
- Institutional controls / deed restrictions will be required to prevent development on the landfill cap and prevent development within the drainage ways.

STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e. reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment). Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is protective of human health and the environment. The first five-year review was completed in June 2005 and next scheduled review is in June 2010.

RECORD OF DECISION AMENDMENT DATA CERTIFICATION CHECKLIST

The following information is included in the Decision summary section of the Record of Decision Amendment. Additional information can be found in the Administrative Record located at the Monroe County Public Library.

- Chemicals of concern and their respective concentrations are located on Pages 5 and 10.
- Baseline risks represented by the chemicals of concern are located on Pages 15 through 18.
- Cleanup levels established for chemicals of concern and the basis for these levels are located on Pages 28 and 35.

- Description of how source materials constituting principal threats are addressed is addressed on Page 34.
- Description of the current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD Amendment are located on Page 12.
- Description of the potential land and groundwater use that will be available at the site as a result of the implementation of the passive quarry drain and groundwater interceptor trench with treatment is located on Page 12.
- Description of the estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected is located in Table 8.
- Description of the key factors that led to selecting the remedy is located on Page 30.

AUTHORIZING SIGNATURES AND SUPPORT AGENCY ACCEPTANCE OF REMEDY

The United States Environmental Protection Agency is the lead Agency for developing and preparing this Record of Decision Amendment. The State of Indiana, City of Bloomington, and Monroe County are signatories to the Consent Decree and those parties have all submitted letters of concurrence for the implementation of the above referenced alternative.

Richard C Karl

Richard C. Karl, Director
Superfund Division

9-29-06

Date

RECORD OF DECISION AMENDMENT
LEMON LANE LANDFILL
OPERABLE UNITS 2 AND 3

SITE NAME, LOCATION, AND BRIEF DESCRIPTION

CBS Corporation (formerly known as Westinghouse Electric Corporation and Viacom Inc.) owned and operated a capacitor production facility in Bloomington. The insulating fluid used in the manufacture of the capacitors contained polychlorinated biphenys (PCBs). The Lemon Lane Landfill was operated as a sanitary landfill from the late 1930s to 1964. From 1958 until the fall of 1964, PCB filled capacitors, PCB contaminated rags, sawdust, and filter clay were disposed of at the Lemon Lane Landfill. Extensive salvaging of capacitors along with large scale burning of landfill material occurred during the landfill operation. In addition, evidence indicates other industrial wastes were disposed of in the landfill. The landfill is situated over two sinkholes that were filled with landfill material prior to PCB disposal. The total volume of landfill material was approximately 200,000 cubic yards based on landfill borings completed in 1996.

The Lemon Lane Landfill is located on the northwest side of the City of Bloomington in Monroe County, Indiana. Figure 1 is a general site location map. The original landfill covered approximately 10 acres. The City of Bloomington owns a majority of the landfill property. Lemon Lane Road and a residential area along Lemon Lane bounds the east side of the landfill. The CSX Railroad tracks border the southern edge of the landfill and directly south of the railroad tracks is Valhalla Cemetery. Jerry Pelfree owns the property directly north of the site. The northern part of the landfill occupies a small part of property that Mr. Pelfree owns. Bordering the northeast corner of the site outside the fence is the Sexton property. On the east side of Lemon Lane Road are the Bender and Elliot properties. CBS owns the undeveloped land to the west of the landfill. The Griffin property borders the southern portion of the east fence line of the landfill.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Lemon Lane Landfill was placed on the National Priorities List (NPL) in October 1982 and was one of the six sites to be remediated under the terms of a Consent Decree (CD) entered by the United States District Court for the Southern District of Indiana on August 22, 1985. The Consent Decree called for the construction of a permitted, Toxic Substances Control Act (TSCA) approved, dedicated, municipal solid waste-fired incinerator to be used to destroy PCB contaminated soils and materials excavated from the six sites.

Public opposition to the incinerator arose before and after entry of the Consent Decree. CBS submitted applications for the necessary permits to design and build the incinerator in 1991. The Indiana State Legislature, however, passed several laws which prevented any immediate consideration of CBS's permit application. In February 1994, the parties settled upon a set of principles to guide the process of exploring alternative remedies. These principles, known as the

Operating Principles, provided, among other things, that the selection of remedial alternatives would be conducted in accordance with EPA's Record of Decision (ROD) Amendment process.

In November 1997, Judge S. Hugh Dillin issued an Order requiring that the six Consent Decree sites be remediated by December 1999. Judge Dillin also assigned Special Master Kennard Foster to oversee the progress of the parties toward meeting the December 1999 deadline. On February 1, 1999, Judge Dillin issued another Order approving and adopting the Report and Recommendations of Special Master Kennard Foster which (1) extended the deadline for completion of the source control at the remaining five sites until December 31, 2000, and (2) ordered the parties to engage in future settlement discussions with respect to other issues, including remedial measures to address groundwater and surface water contamination. The source control remedies were completed by the December 31, 2000 deadline and CBS and the governmental parties are in the process of negotiating a global settlement[1] for all of the remaining issues regarding the six Consent Decree sites.

Interim measures were implemented by CBS and the U.S. EPA at and near the Lemon Lane Landfill. In 1987, CBS removed, and incinerated off-site, 404 capacitors from the landfill surface. In addition, CBS placed a temporary flexible membrane liner over the landfill surface to prevent water from infiltrating into the waste material. A sediment cleanup was completed in Clear Creek for approximately 2,770 feet near the Winston Thomas Wastewater Treatment Plant site. EPA funded the construction of a 1,000 gallon per minute (gpm) water treatment plant, along with storage for 1.2 million gallons of storm water at the Illinois Central Spring (ICS), which is hydraulically connected to the Lemon Lane Landfill, through a time-critical removal action. The water treatment plant went online in May 2000 and was operated by the EPA until August 2001. The operation and maintenance was then funded for three years by the Indiana Department of Environmental Management (IDEM). Since August 2004, an agreement has been in place for EPA, CBS, the City of Bloomington and IDEM to fund the operation and maintenance of the treatment plant.

EPA issued the Proposed Plan for the Lemon Lane Landfill source control operable unit 1 (OU 1) on January 3, 2000 and held 60 days of public comment. The other governmental parties (IDEM, City of Bloomington, Monroe County) concurred on the Record of Decision (ROD) Amendment. The ROD Amendment was signed by the U.S. EPA on May 12, 2000.

The source control operable unit involved the following:

- Excavation and disposal of 80,087 tons of PCB contaminated material greater than or equal to 50 parts per million (ppm) to Environmental Quality Company's Wayne Disposal Landfill in Belleville, Michigan.

- Excavation and transport of total of 4,402 capacitors to Onyx Environmental in Port Arthur, Texas for incineration.

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[1] The global settlement will include both technical and non-technical issues.

- Consolidation of 40,000 cubic yards of landfill material within the landfill boundary to shrink the size of the landfill to approximately 9 acres.

- Installing a Resource Conservation Recovery Act (RCRA) Subtitle C compliant cap over the remaining landfill material. The cap consists of 6-inches of topsoil, 18-inches clean granular fill, a geocomposite drainage layer, 40 millimeter thick geomembrane, geosynthetic clay layer and perimeter drainage/stormwater retention pond.

- Installing 4 piezometers into the landfill to determine if the landfill waste is becoming backflooded and getting wet.

- Cleaning up areas outside the landfill boundary.

- Implementing a Groundwater Monitoring Plan and Cap Inspection Plan.

The Lemon Lane RCRA Cap Inspection and Maintenance Plan was approved in June 2001 and the following activities are performed by CBS:

- Routine site inspections are completed quarterly to determine if damage has occurred to the landfill cap and repairs made as needed.

- Mowing is completed as needed.

- Application of herbicide at the fence line and rip rap drainage ways completed annually.

- Topographic survey/subsidence report is completed biennially (every two years).

The continuing release of PCBs and other hazardous constituents from springs connected to the Lemon Lane Landfill and the subsequent contamination of soils and sediment from the releases from these springs requires the need for two additional operable units.

COMMUNITY PARTICIPATION

The community has been involved at the Lemon Lane Landfill site. The EPA has funded a Technical Assistance Grant (TAG) with a citizens group called Citizens Opposed to PCB Ash (COPA). In addition to hiring experts to review documents, COPA has also developed a web page (www.copa.org) to distribute information to the public. The EPA and State have participated in at minimum, quarterly Citizens Information Committee meetings with the public to update them on the recent site activities. These meetings are shown on the local Bloomington cable access station.

The Proposed Plan for the water treatment operable unit (OU 2) and sediment operable unit (OU 3) for the Lemon Lane Landfill site was made available to the public for 30 days on June 14, 2006. A 30-day extension of the public comment period was granted and the public comment period ended on the Proposed Plan on August 12, 2006. The Administrative Record (AR) in electronic form was placed in the Monroe County Public Library. Interested parties were able to receive copies of the AR for review and for the development of comments on the Proposed Plan for OU 2 and OU 3. Approximately 5,000 OU 2 and OU 3 Proposed Plan postcards were mailed to residents in the Bloomington area and an Internet link was provided to a fact sheet for review.

A public meeting was held on July 13, 2006, to present the Proposed Plan for OU 2 and OU 3 to the public. Representatives from EPA and the State of Indiana were present to answer questions. EPA response to comments received during the public comment period is included in the Responsiveness Summary, which is part of this Record of Decision Amendment for operable units 2 and 3.

SCOPE AND ROLE OF THE OPERABLE UNITS

This action is the final action for the Lemon Lane Landfill site and addresses both contaminated groundwater and sediment, known respectively as operable units 2 and 3. The 2000 ROD Amendment addressed the source control and addressed the principal threat waste by disposing of PCB contaminated material off-site in a chemical waste landfill and incinerating PCB capacitors filled with PCB contaminated oil off-site at a permitted facility. The remaining landfill material was capped with a RCRA Subtitle C compliant cap. These final two operable units are intended to prevent current and future exposure to contaminated media through treatment and containment of groundwater and sediment. The treatment of groundwater in this response is intended to permanently reduce the toxicity, mobility, and volume of the releases of PCBs into Clear Creek.

SITE CHARACTERISTICS

A number of investigations were completed to characterize the site and determine the nature and extent of contamination at the Lemon Lane Landfill. The investigations include the following:

- Borings and corings to delineate site stratigraphy.
- Borehole and surface geophysics.
- Monitoring well development, water level measurement and sampling.
- Aquifer hydraulics testing using slug tests and pump tests.
- Spring flow measurement and storm flow hydrograph analysis.
- Spring flow contaminant sampling during non-storm and storm conditions.
- Basin delineation and flow analysis using dye tests and modeling.
- Site and area field surveys and historical photo reviews to identify key surface features related to karst development and structure.
- Sediment and soil sampling at the Illinois Central Spring (ICS) emergence, swallowhole area and Quarry Springs area.
- Sediment sampling including surface sampling, deep borings, bank sampling, and floodplain sampling in Clear Creek.

Site Geology

The Lemon Lane Landfill lies on the eastern margin of the Mitchell Plain. The Lemon Lane Landfill and surrounding area is a karst terrain. Karst terrain is a landscape produced through the interaction of slightly acidic rainwater with soluble limestone bedrock. This process known as dissolution forms a variety of landscape features, including sinkholes, subterranean voids, solution conduits, caves, and springs. Drainage in the Lemon Lane Landfill area is predominantly subterranean through the karst features. The drainage is characterized by rapid groundwater flow from sinkholes through a branchwork of subterranean solution conduits and caves to discharge points at springs. Contaminants in karst groundwater may move rapidly through the drainage network to springs located miles from the source area without the benefit of normal natural attenuation processes.

The site is near the watershed divide between Clear Creek to the south and Stout's Creek to the north. The landfill is underlain by 70 to 80 feet of the St. Louis Limestone and the soil cover over the St. Louis Limestone ranges in thickness from 5 to 20 feet at the landfill site. The Salem Limestone (70 to 80 feet thick) underlies the St. Louis Limestone and the Harrodsburg Limestone underlies the Salem. The St. Louis Limestone in the vicinity of the landfill is thinly bedded and contains limestone, dolomite, and shale. Solution cavities, joints, and other fractures serve as routes for groundwater movement.

Site Hydrogeology

A number of investigations were completed for groundwater and surface water at the Lemon Lane Landfill. Water studies, including dye trace studies, demonstrated that a majority of low flow and storm water drainage from the Lemon Lane Landfill discharges at ICS, located about 2,500 feet southeast of the site. ICS is the headwater of Clear Creek, which runs through the City of Bloomington and joins Salt Creek near the Monroe Dam. Other springs located near the landfill are also connected to the site. Sampling has shown PCB contamination from the Lemon Lane Landfill in the following springs:

- Illinois Central Spring
- Quarry Springs
- Slaughterhouse Spring
- Rinker Spring

Figure 2 shows the location of spring, sink, and surface water locations.

The spring water discharge from ICS varies in direct response to precipitation. During very dry periods, spring flow is under 30 gpm, but during storm periods peak flow rates at the spring may approach 5,000 gpm. The PCB content of the spring water varies with spring flow. Generally, under low flow conditions, PCB concentrations range from about 5 to 20 parts per billion (ppb). During storms, PCB concentrations in excess of 500 ppb may occur as well-defined concentration peaks. These peaks appear to represent "flushes" of PCBs from storage in the shallow, highly cavernous, "epikarst" portion of the limestone bedrock. The travel time of the PCB flush from the landfill to ICS is inversely related to the flow rate, with the maximum PCB concentration appearing between two hours before and 40 hours after the peak flow rate. Generally, larger intense storms generate larger peak PCB concentrations.

Prior to 1999, discharge from ICS flowed through a culvert beneath the Indiana Central Railroad embankment and southeastward down the ICS Branch. With the construction of the current Illinois Central Spring Treatment Facility (ICSTF) in 1999, this culvert was plugged. A new culvert was driven beneath the railroad embankment to route the spring flow into the new Spring Receiving Sump (SRS). The SRS pumps ICS spring water for treatment to the ICSTF. Treated ICS water is returned to the surface channel and operates cyclically as water is pumped from the SRS to the ICSTF for treatment.

Formerly, water discharged from ICS followed a surface channel southeastward approximately 500 feet to a karst swallowhole (principal swallowhole). Currently, the ICSTF discharge drains to this swallowhole. Under low flow conditions, the principal swallowhole accepts all the spring flow. At spring discharges exceeding about 200 to 300 gpm, the hydraulic capacity of the principal swallowhole is exceeded and overflow of the principal swallowhole occurs. This overflow follows a network of shallow surface channels to the overflow swallowhole. During times of heavy rainfall, the capacity of the overflow swallowhole is exceeded and surface drainage occurs through a culvert beneath a former railroad embankment. Figure 3 identifies the site features and shows the flow path for the effluent.

Additional springs discharge downstream of the overflow swallowhole. A spring called Quarry A is located at the toe of the railroad embankment near the current ICSTF entrance gate. Downstream from the Quarry A Spring, the ICS Branch flows southeast in a shallow channel. The channel bends abruptly to the west 350 feet below Quarry A and flows an additional 100 feet to the base of the ICSTF entrance road embankment. The flow from an 18-inch culvert enters the channel from the west at this point and is referred to as the Quarry B culvert.

To determine if ICS was connected to the Quarry Springs area, in 1988, CBS completed a dye trace study into the ICS Branch at ICS. The dye plume was observed to enter the principal swallowhole and was observed at Quarry A Spring about 30 minutes later and at Quarry B Spring about 1 hour later. This dye trace established a direct hydraulic connection from the principal swallowhole to both Quarry A Spring and Quarry B Spring.

The culvert that extends beneath the ICSTF entrance road extends to a 13.5 foot deep stormwater manhole on the west side of the road. Flow is always observed in the bottom of this manhole. An analysis of aerial photography from 1949 shows a spring located about 150 feet northwest of the Quarry B manhole. The spring has been covered with approximately 25 feet of post-1949 fill. The flow in the bottom of the Quarry B manhole is probably derived from this buried spring. This buried spring is referred to as Quarry B Spring. Another dye trace was completed in October 2001 in which water, including effluent, was prevented from entering the principal swallowhole. Dye was placed at the landfill and was observed at ICS, but was not observed at Quarry B Spring. This dye trace established that ICS was not connected directly to Quarry B Spring.

Evaluating the flow from both Quarry A Spring and Quarry B Spring is difficult due to a number of factors that influence the flow. Flow at Quarry A appears to be greatly increased when water overflows the ICS principal swallowhole. When the ICS principal swallowhole is able to take all of the ICSTF discharge, flow at Quarry A is lower, but does not cease except during very dry periods. Quarry A Spring appears to be fed by both the principal and overflow swallowholes. Quarry B Spring appears to maintain a much higher base flow than Quarry A. It is clearly fed by the ICS principal swallowhole but may have additional drainage area to the west.

Rinker Spring is located northeast of the Quarry A Spring. Two 8-inch pipes discharge from an embankment to form Rinker Spring.

Monitoring of the Quarry A, Quarry B and Rinker discharge was conducted at the downstream culvert. Sampling data from 1995 and 1996 at the downstream culvert generally indicate a PCB concentration of 3 to 10 ppb PCBs. After the ICSTF began operation the PCB concentrations at the culvert reduced to 0.5 to 2 ppb PCBs. Quarry A and B springs have been monitored on a monthly basis since September 2004 and Rinker Spring has been monitored on a monthly basis since May 2005. These sampling data suggest that Quarry A and Quarry B all have similar PCB concentrations. Concentrations are generally 0.5 to 1 ppb PCBs. Rinker Spring PCB concentrations tend to be slightly higher and range from 1 to 3 ppb PCBs.

Slaughterhouse Spring is located north of the Lemon Lane Landfill (See Figure 2). Dye trace studies establish that Slaughterhouse Spring is hydraulically connected to Lemon Lane Landfill. Slaughterhouse Spring has been sampled quarterly since November 2000. Three detections just above the PCB laboratory detection limit of 0.1 ppb have occurred. The spring samples have been non-detect for PCBs since May 2001. Two storm event sampling events were conducted in October 2003 and November 2003. Sampling took place hourly for 36-hours in the October 2003 storm event and 48 hours of hourly sampling for the November 2003 storm event. Sampling from the October 2003 event did not produce any detections of PCBs and the November 2003 sampling event produced 2 detections slightly above the 0.1 ppb PCB level.

In addition, monitoring wells surrounding the Lemon Lane Landfill also have shown PCB contamination.

Between September 1995 and June 1996, CBS completed the sampling of 29 residential wells within a one mile radius of the Lemon Lane Landfill. The results showed those wells were not contaminated with PCBs. These wells are not currently used by residents for drinking water.

Discharge/Capture Model

To evaluate the flow and PCB mass released at ICS, a discharge/capture model was developed to estimate the fraction of ICS spring flow and PCB mass treated by various water treatment plant capacities and storage scenarios. The EPA constructed an interim water treatment plant designed to treat 1,000 gpm and have approximately 1.2 million gallons of storage for stormwater.

The model was developed through analyzing ICS flow records from August 21, 2001 to February 24, 2004, and by evaluating the results from 659 PCB samples. Since PCB data was not collected continuously, relationships were developed for both non-storm and storm data to predict PCB concentrations based upon a flow rate from ICS. The PCB mass discharged and the ICS flow data were placed into a model to evaluate the current interim water treatment plant and to evaluate other plant expansion scenarios. A number of assumptions were used in the development of the model and are as follows:

- The storm event PCB mass is evenly distributed over a four hour period extending from one hour prior to the peak to three hours after the peak.
- The model considers only data from August 2001 to February 2004. It may give PCB capture values indicative of typical yearly capture values to the extent the distribution and magnitude of storms for this period were average.
- The captured PCB mass is treated and the PCBs are quantitatively removed from all spring flow volume passing through the plant.

Discharged volumes exceeding plant storage are considered to be untreated with no reduction in PCB mass. That is, the model considers no treatment or PCB removal by settling of PCBs from water passing through storage. Some sampling events have shown as much as an 80% reduction in PCB mass due to PCBs settling out of the water in the tanks, but an exact percentage cannot be determined due to the variability of the storm events.

During the August 21, 2001, to February 4, 2004, timeframe, ICS discharged 401,317,000 gallons of PCB contaminated water and the ICSTF treated 366,120,197 gallons or 91.2 percent of the spring discharge. An estimated 20,900 grams (46.1 pounds) of PCBs were released from the spring and 15,612 grams (34.4 pounds) or 74.7 percent of the total PCB discharge was captured. The difference between the volume captured and mass is due to "back to back" storm events that prevent the treatment of storm water once the 1.2 million gallons of storage is filled. Table 1 and Table 2 are developed from the model which gives percentages of ICS water treated and percentage of ICS PCBs treated based upon different storage and plant capacity scenarios.

The percentages calculated from the model are conservative because the model does not assume that PCBs settle out in the storage tanks. Testing has shown that the storage tanks are effective in settling PCBs and sampling of sediment at the bottom of the storage tanks after they have been drained have shown high concentrations of PCBs. Sampling shows PCB mass reduction as high as 80% through settling in the two stormwater storage tanks. Table 3 shows the percentage of PCBs treated with 80% settling in the storage tanks.

Percentage of ICS Water Treated			
Storage in million gallons	Plant Treatment Capacity (gpm)		
	1,000	1,500	2,000
1.2	91.2	95.8	98.1
1.8	92.8	96.8	98.6
2.4	94.1	97.6	99.0

Table 1 – Percentage of ICS Water Treated

Percentage of ICS PCBs Treated			
Storage in million gallons	Plant Treatment Capacity (gpm)		
	1,000	1,500	2,000
1.2	74.7	85.0	92.2
1.8	78.2	88.1	93.9
2.4	81.6	90.5	95.6

Table 2 – Percentage of ICS PCBs Treated

Percentage of ICS PCBs Treated With 80% Settling in Storage Tanks			
Storage in million gallons	Plant Treatment Capacity (gpm)		
	1,000	1,500	2,000
1.2	94.9	97.0	98.4
1.8	95.6	97.6	98.9
2.4	96.3	98.1	99.1

Table 3 – **Percentage of ICS PCBs Treated with 80% Settling**

Conduit Study

Since 1998, CBS has undertaken a karst conduit study adjacent to the Lemon Lane Landfill. The purpose of this investigation was to determine if source areas and pathways could be found beneath the site area and to determine if remediation activities at the landfill could be implemented to reduce or eliminate PCBs at ICS. Specific goals of CBS's investigation are as follows:

- Identify particular locations within the karst aquifer near the site where high concentrations of PCBs reside and are being mobilized into the conduit system, especially during high flow storm events.
- Discover local pathways that PCBs were taking as they are mobilized from the source area.
- Identify sources of recharge that mobilize the PCBs from their specific location.
- Locate the conduit or conduits that transmit the PCBs to the Illinois Central Spring.

The karst conduit investigation has consisted of many different types of investigation activities. A number of different geophysic techniques were used to identify possible conduits for drilling. Using that information, a large number of wells and piezometers were installed to understand how groundwater leaves the site area and travels to ICS. Dye trace tests were completed to identify karst conduit pathways and to help in the identification of source areas in the rock outside of the landfill cap. A series of pump tests were completed to determine if PCBs can be captured near the site. Also, a series of flush tests were completed to mobilize PCBs in the rock outside of the landfill cap to help discern source areas and karst conduits.

Even though the remedial actions selected in this ROD Amendment constitute the final remedy for the Lemon Lane Landfill, CBS may continue to perform its karst conduit investigation for areas outside the landfill cap. Pumping groundwater at the landfill does not appear feasible at this time, but CBS has identified possible source areas southeast of the landfill cap and deep in the rock. If the conduit investigation produces possible remedial alternatives to improve the effectiveness and reduce costs of this final remedy, EPA may issue a new Proposed Plan for public comment.

Sediment Investigation

Sediment investigations were completed for the area surrounding ICS, the area surrounding the principal swallowhole, the area around Quarry Springs, and in Clear Creek to where it meets Salt Creek. Sampling for PCBs includes surface sampling, sampling at depth by the use of borings, bank sampling, and floodplain sampling.

Sampling at the ICS emergence includes both sediments and soils. PCB results for sediments range from 1.7 to 73 ppm. Soil at the ICS emergence show PCB concentrations that range from 0.13 to 200 ppm. Figure 4 shows the results of the sampling at the ICS emergence.

At the swallowhole area, PCB results for sediment sampling range from 9.6 to 130 ppm. Soils show PCB results ranging from non-detect to 47 ppm PCBs. Figure 5 shows the results of the sampling at the swallowhole area.

The area around the Quarry Springs also was sampled and the results establish that drainage areas have PCBs ranging from 0.24 to 48 ppm and soils show a range from non-detect to 28 ppm. Figure 6 shows the results of the sampling at the Quarry Springs area.

The sediment investigation for Clear Creek began with EPA completing a sediment thickness study which consisted of measuring the thickness of sediment in Clear Creek from the Gordon Pike Road to the point where Clear Creek meets Salt Creek. The data from the sediment thickness study was used to develop sediment sampling plans. For this analysis, Upper Clear Creek was broken up into two sections along with Lower Clear Creek. The data was evaluated through mathematical interpolation. The depth of sediment in upper North Clear Creek (6.3 miles downstream of where Gordon Pike Road crosses Clear Creek) shows a mean depth of 1.05 inches with a majority of locations having no sediment. Lower North Clear Creek (6.4 miles from the farthest point downstream point of Upper Clear Creek) shows a sediment thickness on average of 1.10 inches with a majority of locations not having sediment present. Lower Clear Creek (from where Old State Route 37 crossed Clear Creek to where Clear Creek intersects Salt Creek) shows an average sediment thickness of 13.17 inches. Figure 7 shows a representation of the sediment thickness in Clear Creek.

A number of sampling events in Clear Creek have taken place over the years. The first sampling event in Clear Creek took place in lower Clear Creek in June 2004. A total of 73 locations were sampled and included 50 instream surface samples, 13 instream cores and 10 bank samples. In September 2005, Lower Clear Creek was sampled again and consisted of 10 instream surface samples, 24 banks samples at 8 locations, and 17 core samples at 5 locations.

Upper Clear Creek was sampled in May 2005 and 20 in-stream samples, 40 bank soil samples at 20 locations, and 12 core samples at 4 locations. Upper Clear Creek floodplain sampling was completed in September 2005 and consisted of 16 samples at 12 locations.

The floodplain sampling at Fluckmill Road, disclosed a sewage sludge disposal site contaminated with high concentrations of PCBs. During the 1970s, sewage sludge from the former Winston Thomas wastewater treatment plant was available to citizens to use as fill. Unknown at the time, PCBs from the Westinghouse capacitor plant had contaminated the sewage sludge. Based upon the sampling results and the type of soil at the Fluckmill location, it appears that sewage sludge may have been used to fill in low areas of the property. This floodplain contamination will be addressed through a separate action.

Figures 8 and 9 show the results of the sediment sampling events in Clear Creek.

PCB concentrations were also evaluated and the north section (Gordon Pike to Old 37) showed an average PCB concentration of 0.19 ppm, with a maximum PCB value of 1.2 ppm. The south section (Old State Route 37 to Salt Creek) showed an average PCB concentration of 0.91 ppm, with a maximum concentration of 9.2 ppm PCBs. Since much more sediment is present in the southern portion of the creek, PCB concentrations were interpolated based upon depth of sediment. From 0 to 3 inches the average sediment PCB concentration was 0.62 ppm to 0.66 ppm. From 3 to 6 inches the average PCB concentration was 1.10 to 1.21 ppm. From 6 to 12 inches, the average PCB concentration was 1.27 ppm to 1.28 ppm. Finally, from 12 to 31 inches, the average PCB concentration is 2.19 to 2.25 ppm PCBs.

CURRENT AND POTENTIAL FUTURE LAND AND WATER USES

The area surrounding the Lemon Lane Landfill is a mixture of both residential and commercial property. CBS owns a large piece of undeveloped property west of the landfill and this property may be used for commercial development in the future. The source control completed in 2000 reduced the size of the landfill and the landfill was fenced. Institutional controls, including deed restrictions to prevent disturbance of the landfill cap will be put in place.

Drinking water for the City of Bloomington is supplied by Lake Monroe which is not affected by the Lemon Lane Landfill. The continuing release of PCBs into Clear Creek from the springs connected to the landfill has, however, impacted fish and sediment in the Creek. EPA evaluated the incidental ingestion of water and sediment from Clear Creek along with the affect on recreational fishing in the Human Health Risk Assessment.

SUMMARY OF SITE RISKS

EPA completed two focused risk assessments for the purpose of quantifying the threat to public health and the environment from actual or threatened releases of hazardous substances into the environment. The chemical of concern is PCBs. One risk assessment focused upon the current and future effects of such releases on human health. The other assessment focused upon the current and future effects of such releases upon the environment. Each risk assessment is discussed, in turn, below.

<u>Human Health Risks</u>

A Superfund human health risk assessment estimates the baseline risk to human health. The human health risk assessment is an estimate of the likelihood of health problems occurring if no cleanup action were taken at a site. To estimate the baseline risk at a Superfund site, EPA undertakes a four-step process:

Step 1: Analyze Contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers

Step 4: Characterize Site Risk

In Step 1, EPA evaluates the data collected at a particular site to determine which data is appropriate to consider in the risk assessment. For example, the most recent data are used rather than historical data because concentrations of PCBs in water and fish tissue can change over time and current data are most reflective of future concentrations. Next, EPA looks at the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals when human studies are unavailable). Comparisons between site-specific concentrations and concentrations reported in past studies helps EPA to determine which contaminants are most likely to pose the greatest threat to human health.

In Step 2, EPA considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, EPA calculates a reasonable maximum exposure (RME) scenario, which represents the highest level of human exposure that could reasonably be expected to occur.

In Step 3, EPA identifies and summarizes the basis for information on the toxicity of each of the contaminants identified in Step 1. Specifically, toxicity factors reflecting each chemical's potential for causing cancer or other noncarcinogenic health effects are identified and documented in accordance with EPA guidance.

In Step 4, EPA combines, evaluates, and summarizes the results of the previous three steps in order to characterize site risks. EPA adds up risks from the individual contaminants and exposure pathways to generate total site risks. EPA then assesses whether site risks are great enough to cause health problems for people living or recreating near the site.

As part of a Superfund risk assessment, EPA considers two types of risk: carcinogenic and noncarcinogenic. The likelihood of any cancer resulting from a Superfund site is generally expressed as an upper bound probability; for example, a 1 in 10,000 chance. In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer health effects, EPA calculates risk differently. The key concept here is that a threshold level exists below which non-cancer health effects are no longer predicted. This threshold level is conservatively represented by a reference dose (RfD). Noncarcinogenic risks are calculated as the ratio of potential exposure to the RfD; this ratio is referred to as a hazard quotient (HQ). A HQ of greater than 1 indicates a potential for adverse health effects.

EPA calculated PCB risks at the Lemon Lane Landfill site through two methods (Aroclor and Toxicity Equivalent). As background, PCBs are mixtures of up to 209 individual chlorinated compounds called congeners. Many commercial PCB mixtures are known in the United States as Aroclors. Laboratory analysis included measuring PCBs by the

Aroclor method and the congener method. With the congener method, thirteen of the 209 congeners are referred to as dioxin-like PCBs, as they produce a toxic response similar to 2,3,7,8-tetrachloro-p-dioxin (TCDD). The concentration of each congener is converted to a dioxin equivalent which is referenced as the toxicity equivalent (TEQ).

In evaluating the human health risks posed by the on-going PCB releases from the Lemon Lane Landfill, EPA focused on the health effects to children, youths and adults coming into contact with water, sediment, and soil (including bank soil, floodplain soil, and surface soil) in and along Clear Creek and the Quarry Springs area, along with eating fish from Clear Creek. EPA believes that human exposure to PCBs from the site results from a variety of pathways:

- Consumption of fish from Clear Creek
- Exposure to sediment within Clear Creek and Quarry Springs area through skin contact and incidental ingestion
- Exposure to surface water within Clear Creek and Quarry Springs area through skin contact and ingestion
- Exposure to soil (including bank soil, floodplain soil, and surface soil) in and along Clear Creek and Quarry Springs area through skin contact and ingestion

Extensive fish sampling occurred over the years in Clear Creek. To evaluate the risk to humans, however, 2004 sampling data was used because it is the most recent data. Fish tissue was sampled in 2004 at the following locations:

- Allen Street (1.5 miles downstream from the site)
- Country Club Road (3 miles downstream from the site)
- Fluckmill Road (10 miles downstream from the site)
- Strain Ridge Road (20 miles downstream from the site)

Both pelagic fish (water-column swimming fish such as green sunfish, longear sunfish, rock bass, largemouth bass) and benthic fish (bottom-dwelling fish such as white sucker, northern hogsucker, redhorse) were sampled and a conversion of one-quarter was used to convert whole fish PCB concentrations to fillet PCB concentrations for pelagic fish and one-half was used for benthic fish. Table 4 below is a summary of the average PCB fish concentrations. EPA recognizes that anglers are unlikely to consume large amounts of benthic fish and are more likely to consume pelagic fish. However, a variety of large benthic fish are present in Clear Creek. Therefore, for the purposes of the risk assessment, EPA calculated the concentration of PCBs in fish tissue consumed by anglers as a weighted average assuming 90 and 10 percent of the fish consumed by anglers is pelagic and benthic fish, respectively. The calculated weighted average PCB and TEQ concentrations used in the risk assessment are also presented in Table 4 below:

Table 4 - Summary of Average PCB Fish Tissue Concentrations

Fish Tissue	Country Club Road	Fluckmill Road	Strain Ridge Road
Pelagic – PCBs in ppb	416	768.8	480.9
Pelagic – TEQ in ppt	9.6	9.5	9.3
Benthic – PCBs in ppb	744.5	895.8	1243.8
Benthic – TEQ in ppt	10.1	7.1	15.5
Weighted Average – PCBs in ppb	448.9	781.5	557.2
Weighted Average – TEQ in ppt	9.65	9.3	9.9

ppb – parts per billion; ppt – parts per trillion

As part of evaluating risks to human from the consumption of fish from Clear Creek, an analysis of the amount of fish within the creek was completed to determine if enough fish were available to consume. Reach-specific fish tissue ingestion rates were developed based on (1) the expected fish tissue biomass present in each Clear Creek reach, (2) the fish tissue ingestion rates supported in other Bloomington area streams, and (3) fish tissue ingestion rates discussed in the literature. Based on this analysis, EPA determined that the following reach-specific fish tissue ingestion rates should be evaluated:

- Country Club Road – 3 grams fish per day
- Fluckmill Road – 12 grams fish per day
- Strain Ridge Road – 25 grams fish per day

Note: In evaluating the risk, EPA determined that the fish at Allen Street were not of sufficient size or type to justify further consideration in the human health risk assessment.

Though Table 4 shows that the concentrations of PCBs in fish tissue assumed for the risk assessment are similar across all three reaches evaluated, the differences in reach-specific fish tissue ingestion rates resulted in greater risks as the distance downstream from the site increased (in other words, risks at Country Club Road are less than risks at Fluckmill Road, are less than risks at Strain Ridge Road). Specifically, using EPA risk assessment guidance and procedures the following carcinogenic and noncarcinogenic risks were calculated for an adult RME recreational angler eating fish from Clear Creek[2]:

- Carcinogenic risks based on PCBs between 1 in 1,000,000 (1E-06) and 1 in 10,000 (1E-04) at all three reaches: Country Club Road (8.3E-06); Fluckmill Road (5.7E-05); and Strain Ridge Road (8.5E-05).
- Carcinogenic risks based on dioxin-like PCBs (TEQs) greater than 1 in 100,000 (1E-05) at Country Club Road (1.3E-05) and Fluckmill Road (5.1E-05) and greater than 1E-04 at Strain Ridge Road (1.1E-04).
- Noncarcinogenic risks for adults based on PCBs less than 1 at Country Club Road

[2] Please see the Response to Comments on the U.S. EPA's Human Health Risk Assessment for a more detailed analysis

(0.48), and greater than 1 at Fluckmill Road (3.4) and Strain Ridge Road (5.0). (Note: noncarcinogenic risks for children are about 2.5 times higher than those for adults and exceed 1 at all three locations).

- Noncarcinogenic risks for adults based on dioxin-like PCBs less than 1 at Country Club Road (0.21) and Fluckmill Road (0.80) and greater than 1 at Strain Ridge Road (1.8). (Note: noncarcinogenic risks for children are about 2.5 times higher than those for adults and exceed 1 at Fluckmill Road and Strain Ridge Road).

Using the EPA point of departure of 1 in 1,000,000 (1 E-06) excess cancer risk and a hazard index greater than 1, an evaluation of the risks throughout the creek shows that unacceptable risks based on fish tissue ingestion are present at all three reaches: Country Club Road, Fluckmill Road, and Strain Ridge Road.

Other exposure pathways in both Clear Creek and the Quarry Springs area were evaluated for risk. Table 5 below is a summary of the average PCB concentrations in surface water, soil and sediment for use in the risk calculations.

Table 5 - Summary of Average PCB Surface Water, Soil and Sediment Sampling

Medium	**Quarry Springs Combined**	**Quarry Springs A**	**Quarry Springs B**	**Quarry Springs C**	**Country Club Road**	**Fluck-mill Road**	**Strain Ridge Road**	**Upper Clear Creek**	**Lower Clear Creek**
Surface Water	1.15E-03				2.6E-05	3.65E-05	2.4E-05		
Soil									
Surface	19.6								
Floodplain								2.09	
Bank								0.61	1.6
Sediment		29.3	3.5	0.6				0.36	1.37

The values in Table 5 were used in the calculation of dermal contact and incidental ingestion risks and the following is a summary of the results for PCBs:

- Dermal contact and incidental ingestion of surface water in Clear Creek produces a carcinogenic risk of less than 1 in 1,000,000.
- Dermal contact and incidental ingestion of surface water in Clear Creek produces a noncarcinogenic risk of less than 1.
- Dermal contact and incidental ingestion of Clear Creek bank and floodplain soil and sediment produces a carcinogenic risk of less than 1 in 1,000,000.
- Dermal contact and incidental ingestion of Clear Creek bank and floodplain soil and sediment produces a noncarcinogenic risk of less than 1.
- Dermal contact and incidental ingestion of surface water, sediment, and surface soil at the Quarry Springs area produces a carcinogenic risk of between 4 in 1,000,000 and 2 in 100,000 and a hazard index of about 1 or less depending on which portion of the Quarry Springs area the exposure takes place.

In summary, the results from the human health risk assessment show that unacceptable risk exists at exposure points up to 20 miles downstream from Lemon Lane Landfill. The total carcinogenic and noncarcinogenic risks are driven by ingestion of fish tissue.

Ecological Risks

To evaluate the risk to ecological receptors, EPA follows a procedure similar to the four-step procedure described above with respect to the human health risk assessment. The ecological risk assessment for the Lemon Lane Landfill site focused on whether exposure to PCBs by mammals and birds feeding on contaminated fish and crayfish from Clear Creek is high enough to potentially cause reproductive problems. Protection of fish-eating birds and mammals is expected to be protective of aquatic organisms as well because PCBs bio-accumulate in species as they progress up the food chain. Therefore, animals that feed on fish are exposed to higher levels of PCBs compared to the fish themselves. Fish-eating mammals are represented by mink, and fish-eating birds are represented by the kingfisher.

The exposures to mink and kingfisher are based on analyses of fish collected from Clear Creek in 2000, 2002, and 2004 and crayfish from 2004. Locations where fish were collected and used in the risk assessment are Allen Street, Country Club Road, Fluckmill Road and Strain Ridge Road. Crayfish were collected at Allen Street. Since crayfish were not collected and sampled for PCBs at all sampling sites and only in the years 1996 and 2004, the ratio of fish and crayfish PCB concentrations were used to model PCBs in crayfish at the locations not sampled.

Risk is evaluated both for total PCBs and for dioxin toxic equivalents (TEQ). Data on dioxin toxic equivalents are available for only a small subset of the fish collected as part of the ecological risk assessment. Accordingly there is greater uncertainty associated with the risk estimates based on TEQ when compared to risk estimates based on total PCBs which have much more sampling data available. Total PCB risks are calculated for both reasonable maximum exposure (RME) based on an upper estimate of the average PCB exposure, and central tendency exposure (CTE) based on the average measured exposure. Data are insufficient for calculating RME dioxin toxic equivalents, so TEQ risk is calculated only for CTE.

Mink exposure is modeled with a dietary composition of 66% fish, 13% crayfish and 21% prey from land, based on a field study in Michigan, and assuming no PCB contribution from non-aquatic prey. Risk is estimated by hazard quotients (HQ) calculated by dividing the modeled dietary PCB concentrations by the dietary concentration resulting in no adverse effects in mink feeding studies (no effect HQ) and the lowest concentration that caused adverse effects (low effect HQ)[3].

The results for total PCBs using 2004 sampling data show that mink are potentially at risk of adverse reproductive effects at Allen Street, Country Club Road, Fluckmill Road and Strain Ridge Road. Using the RME exposure, no effect HQs range from 2 to 4 and "low effect" HQs range from 2 to 3. Using the CTE scenario, again mink are potentially at risk for adverse reproductive effects at the four sampling stations with "no effect"

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[3] Please see the Focused Ecological Risk Assessment for a more detailed analysis

HQs ranging from 2 to 3 and "low effect" HQs ranging form 1 to 2. Similar results are also obtained by using the TEQ approach with "no effect" HQs ranging from 4 to 19 and low effect HQs ranging from 0.9 to 5.

Kingfisher exposure is modeled with a dietary composition of 80% fish and 20% crayfish based on several field studies that were conducted earlier in mid-western states. PCB toxicity studies have not been performed with kingfisher. Therefore, to allow use of toxicity data for other species of birds, kingfisher dietary exposure was converted to dose (PCBs per kilogram bodyweight per day). Since the sensitivity of kingfisher to PCBs is unknown, two sets of PCB toxicity values were used to represent higher and lower sensitivities to PCBs. The risk associated with TEQ dose was evaluated with a single high-quality set of toxicity values. TEQ risk was also evaluated through a separate procedure by modeling the accumulation of dioxin-like PCB congeners in kingfisher eggs. The risks associated with TEQ in eggs were assessed with two sets of toxicity values to represent higher and lower sensitivities to dioxin-like effects.

The results for total PCBs using 2004 sampling data show that kingfisher are potentially at risk of adverse reproductive effects at all of the stations. Using the RME scenario, "no effect" HQs range from 2 to 3 and 7 to 11 for the two PCB sensitivities. The RME "low effect" HQ range is 0.7 to 1 and 2 at all stations for the two PCB sensitivities. Using the CTE scenario, the "no effect" HQs range from 1 to 2 for both sensitivities, and the "low effect" HQs range from 0.5 to 0.7 and 1 to 2 for the two sensitivities. The TEQ dose "no effect" HQs range from 9 to 40, and the "low effect" HQs range from 0.9 to 4. TEQ egg HQs have a broader range compared to the other approaches with "no effect" HQs ranging from 2 to 11 and 18 to 106 for the two PCB sensitivities, and "low effect" HQs ranging from 0.5 to 3 and 6 to 36 for the two sensitivities. Although the values vary among the approaches, most lead to a similar conclusion that kingfisher are potentially at risk at Allen Street, Country Club Road, Fluckmill Road, and Strain Ridge Road.

REMEDIAL ACTION OBJECTIVES

The remedial action objectives (RAOs) provide a general description of what the cleanup will accomplish. The continuing release of PCBs from the spring system connected to the Lemon Lane Landfill has produced unacceptable risks to human health and the environment. The RAOs for operable units two and three are as follows:

- Reduce the amount of PCBs released from groundwater to Clear Creek through mass reduction.

- Reduce PCB levels in fish for beneficial reuse by reducing PCBs released to Clear Creek.

- Reduce the amount of PCB mass in sediments that may be available to fish by reducing PCBs released to Clear Creek.

DESCRIPTION OF ALTERNATIVES

Groundwater Operable Unit

In the Proposed Plan for the Lemon Lane Landfill site, which was made available to the public for comment on June 14, 2006, EPA identified four remedial alternatives to address groundwater contamination at the Site. In its public comments, CBS argued that the remedial alternatives evaluation in the Proposed Plan violates the NCP because EPA did not to consider the alternative of ceasing operations at the current interim water treatment plant. As explained in the attached responsive summary, CBS misreads the requirements of the NCP. While 40 C.F.R. § 300.430(e)(6) states that EPA shall develop a "no action" alternative, it clarifies that the "no action" alternative may be "no further action if some removal or remedial action has already occurred at the site." Here, EPA has already constructed a water treatment plant at the site as part of a time critical removal action. Thus, EPA was under no legal duty to consider the alternative of ceasing operation of the water treatment plant.

Moreover, EPA, did evaluate the alternative of shutting down the plant and determined this option was neither protective of human health and the environment nor complaint with Applicable or Relevant and Appropriate Requirements (ARARs). (See response to Comment 56 in the attached Responsiveness Summary). Specifically, the alternative would not reduce the amount of PCBs released from groundwater to Clear Creek. On the contrary, "no action" would increase the amount of PCBs being released, because the treatment plant would no longer exist to capture and remove PCBs. Likewise, the alternative would increase (not decrease) PCB levels in fish. PCB levels in fish immediately below the site have dropped since the plant began operations in 2000. EPA expects that this trend would reverse if plant operations were discontinued. Finally, this alternative would not comply with ARARs under the Clean Water Act because it would result in PCBs entering into State waters at a concentration ranging between 5 and 1,600 ppb – a level that is significantly above the 0.3 ppb discharge criteria set by the State.

CBS also argues that the "no further action" alternative in the proposed plan is not compliant with the NCP because, according to CBS, EPA did not consider the option of making no capital improvements to the existing water treatment plant. As explained in response to comment 56 in the attached summary, EPA did, in fact, consider this option. In a document titled "Alternative Evaluation: Screening of Remedial Alternatives" issued in June of 2006 ("AE Report"), EPA specifically considered the "no further action" alternative where "no changes would be made to the existing physical facility." (AE Report at Section 4.5). EPA also developed a cost analysis for this alternative where EPA determined the net present value of this alternative to be $5.3 million based upon $0 capital costs and $348,000 in annual O&M costs. (AE Report, Appendix C, Table 1-1 to 1-3). EPA nevertheless determined that all remedial actions selected for further review – including the "no further action" alternative -- should be combined with Modifications A (moving the outfall location from the treatment plant) and Modification B (capturing and treating springs downstream from the treatment plant).

EPA based this determination on the fact that water discharged from the plant would become recontaminated when it entered into the swallowhole area downstream from the plant unless Modification A and B were implemented. This recontamination problem is evident from the fact that site investigations show that treated water entering into the swallowhole area has lower concentrations of PCBs than the water emerging from two springs (Quarry A and Quarry B) downstream from the swallowhole that are hydrologically connected to the swallowhole area. Thus, to prevent water discharged by the treatment plant from becoming recontaminated with PCBs, EPA determined that all the remedial alternatives, including the "no further action" alternative, should include Modifications A & B.

In any event, an evaluation of the "no further action" alternative proposed by CBS (i.e., an evaluation of an alternative making no physical changes to the water treatment plant and not implementing Modifications A and B) shows that this alternative is not the most appropriate remedy for addressing groundwater releases. In response to comment 56 in the attached responsive summary, EPA evaluates the "no further action" alternative proposed by CBS using the nine evaluation criteria mandated by CERCLA and the NCP. Based on this evaluation, EPA determines that any advantage to CBS's proposed "no further action" alternative is far outweighed by advantages afforded by the other remedial alternatives reviewed by EPA in terms of overall protectiveness, long-term (and short-term) effectiveness, and reduction of toxicity and mobility.

The four remedial alternatives reviewed by EPA are discussed below. A Technical Impracticability (TI) waiver is common to all of the alternatives, as well as institutional controls to prevent interference with or disturbance of the remedial action components as well as residential development within the ICS emergence area, the swallowhole area, and the Quarry springs area. Further, long-term multi-media monitoring will be required for each alternative.

Remedy Components

In addition to institutional controls described thereafter, two common elements were considered as part of each of the water operable unit alternatives (excluding the no action alternative) and consist of additional modifications to the existing plant. Modification A will include the treatment of the Quarry B Spring and Rinker Spring and Modification B is the installation of a new effluent line for treated water and stormwater for discharge directly to the Third Street culvert.

Modification A was arrived at based on the analysis of monitoring data for Quarry B Spring and Rinker Spring. It is estimated that Quarry B Spring flows on average 5 gpm with a maximum flow of 500 gpm. Rinker Spring has been estimated to flow at 2 gpm on average with a maximum flow of 100 gpm. The installation of the new effluent line will alter the current groundwater flow conditions and a final flow will be determined for both springs after the installation is complete and the new circumstances evaluated. Quarry A Spring will not be captured since it is anticipated that the Quarry A Spring will not produce any water due to changes in surface water drainage and the scheduled sealing of the principal swallowhole. A sump will be used to collect both springs and the collected water would be pumped back to the water treatment plant for treatment. Capital costs and annual operation and maintenance (O&M) costs for Modification A are $696,000 and $29,000 respectively. Figure 11 shows a conceptual approach for the collection system.

Modification B consists of the installation of a new effluent line which will handle all treated water and stormwater from the ICS water treatment plant. The effluent line will directly discharge to the Third Street culvert, thereby bypassing the swallowhole and Quarry Springs area. It is anticipated that a 36-inch line will be required. Capital costs and annual O&M costs are $272,000 and $9,000 respectively. Figure 11 shows the proposed location of the new effluent line. The location and size of the effluent line may change based upon the final design.

As described below, a TI waiver is common to all of the alternatives.

Alternative 1: No Change to the Current Treatment Plant (1,000 gpm Treatment with 1.2 Million Gallons Stormwater Storage) and Implement Modification A and B

Estimated Capital Cost: $968,000
Estimated Annual O&M: $386,000
Estimated Present Worth Cost: $6,851,000
Estimated Construction Timeframe: 12 months

In this alternative, the water treatment plant capacity would remain the same at 1,000 gpm with 1.2 million gallons of stormwater storage and both Modification A and B would be implemented. The water treatment plant uses an inclined plate clarifier to remove large settleable solids, 3 multi-media filters to further remove particles from the spring water, 2 bag filters to remove very fine particles from the spring water and 4 carbon adsorption vessels each with 20,000 pounds of granulated carbon to remove any dissolved phase PCBs and semi-volatile and volatile organic compounds. Sludge produced from the treatment process contains PCBs and is dewatered on-site in a filter press and testing of the sludge for PCBs and the Toxicity Characteristics Leaching Potential (TCLP) to determine the appropriate off-site landfill disposal.

Evaluating Alternative 1 through the use of the discharge/capture model developed for ICS, approximately 91% of the ICS flow is treated and approximately 75% to 95% of the PCB mass released from ICS is captured based upon no settling in the storage tanks and 80% settling of PCBs in the storage tanks.

Alternative 2: Increase Treatment Plant Capacity to 2,000 Gallon Per Minute with 1.2 Million Gallons Stormwater Storage and Implement Modification A and B

Estimated Capital Cost: $3,136,000
Estimated Annual O&M: $526,000

Estimated Present Worth Cost: $11,151,000
Estimated Construction Timeframe: 12 months

In this alternative, additional treatment capacity would be installed to increase the treatment to 2,000 gpm and Modification A and B would also be implemented. This would include the installation of additional process equipment and controls. The equipment would consist of units identical to those already used in the 1,000 gpm design but the process equipment would be doubled. Sludge would be addressed as described in Alternative 1.

Evaluating Alternative 2 through the use of the discharge/capture model developed for ICS, approximately 98% of the ICS flow is treated and approximately 92% to 98% of the PCB mass released from ICS is captured based upon no settling in the storage tanks and 80% settling of PCBs in the storage tanks.

Alternative 3: Continue to Operate the Current Treatment Plant and Capture and Treat the Overflow from the Two Existing Storage Tanks and Implement Modification A and B

Estimated Capital Cost: $2,223,000
Estimated Annual O&M: $452,000
Estimated Present Worth Cost: $9,112,000
Estimated Construction Timeframe: 12 months

In this alternative, the current 1,000 gpm treatment plant with 1.2 million gallons of storage would continue to operate and Modification A and B would be implemented. During large storm events, water currently overflows the storage tanks and is directly discharged to Clear Creek without treatment. In this alternative, the water that overflows from the two storage tanks would be routed to a treatment system consisting of 8 Calgon Model 12 (or their equivalent), carbon adsorption vessels using 20,000 pounds each of granular activated carbon. The storage tank overflow treatment system would process 5,000 gpm. Based upon a treatability study, the EPA expects the proposed granular activated carbon storage tank overflow treatment system to remove about 95% of the PCBs from the water overflowing the storage tanks. During the design phase, it may be determined that a different configuration may be an improvement to the 8 carbon adsorption vessels proposed and the storage tank overflow treatment system may be modified.

Evaluating Alternative 3 taking into consideration the 1,000 gpm treatment plant system and the addition of the storage tank overflow treatment system would produce nearly 100% treatment of ICS flow and approximately 99% of the PCB mass released from ICS. Figure 12 is a conceptual approach for the overflow treatment system.

Alternative 4: Increase Bulk Stormwater Storage Capacity to 2.4 Million Gallons From 1.2 Million Gallons and Implement Modification A and B

Estimated Capital Cost: $2,320,000
Estimated Annual O&M: $408,000
Estimated Present Worth Cost: $8,538,000
Estimated Construction Timeframe: 12 months

In this alternative, the stormwater storage would be doubled to 2.4 million gallons and Modification A and B would be implemented. Two new storage tanks would be installed as shown in Figure 13. The additional storage of stormwater would allow additional treatment of PCB contaminated water to occur. Evaluating Alternative 4 through the use of the discharge/capture model developed for ICS, 94% of the ICS flow is treated and 82% to 96% of the PCB mass released from ICS is captured based upon no settling in the storage tanks and 80% settling of PCBs in the storage tanks.

Common Elements and Distinguishing Features of Each Alternative

The water and sediment operable units contemplated for the site are subject to two types of ARARs. First, action-specific ARARs set forth requirements on how certain actions must be performed at the site. Second, chemical-specific ARARs set forth numeric values or methodologies for the handling of certain hazardous substances. Each category of ARARs is discussed below.

a. Action Specific ARARs

1. NPDES Requirements

The water operable unit remedial alternatives (except the no further action alternative) requires the expansion and operation of an on-site water treatment plant. This plant will not need to obtain a National Pollutant Discharge Elimination System (NPDES) permit because on-site remedial actions are specifically exempt from such administrative requirements under Section 121(e) of CERCLA, 42 U.S.C. §96219(e). Nevertheless, certain regulations enacted by the State of Indiana under its federally-approved NPDES program are relevant and appropriate to discharges from the plant.

Specifically, the plant is subject to the following action-specific ARARs:

- Surface Water Quality Criteria for Specific Substances - 327 IAC 2-1-6, Table 1
- Conditions applicable to all permits - 327 IAC 5-2-8 (3), (7), (8), (9), (10), (11), (12), (13), (14)
- Considerations in the calculation and specification of effluent limitations - 327 IAC 5-2-11 (a) (1), (2), (3), (4), (5)(C); (d), (e), (f), (g), (h)

- Establishment of water quality-based effluent limitations for dischargers not discharging water to within the Great Lakes system - 327 IAC 5-2-11.1 (a), (b), (d), (f), (g), (h)

- Applicability of Best Management Practices - 327 IAC 5-9-2 (a), (c), (d), (e), (i), (j) and

- Monitoring - 327 IAC 5-2-13 (a), (c), (d), (e), (f).

As noted previously, the State of Indiana has stated in correspondence that it typically sets an effluent limit of 0.3 ppb for PCBs discharged by treatment plants into waters other than the Great Lakes System. The State may establish effluent limits for additional constituents if sampling data provided during the remedial design stage indicates the presence of other contaminants at such levels requiring the establishment of effluent limits. If appropriate, the State of Indiana will determine effluent limits for such contaminants.

Under CERCLA Section 121 (d)(4)(C) EPA may select a remedial action that does not attain a level or standard of control at least equivalent to ARARs if EPA finds that compliance with such requirements is Technical Impracticable from an engineering perspective. As discussed below, EPA is implementing a Technical Impracticability (TI) waiver pursuant to CERCLA Section 121 (d)(4)(C) for certain ARARs that otherwise apply to water that is not treated by the 1,000 gpm treatment plant. Disposal of PCB contaminated oil at the landfill resulted in PCBs migrating deep into the karstic limestone bedrock. High concentrations of PCBs associated with bedrock voids in the southeast portion of the site were discovered during the source control excavation and during CBS's karst conduit investigations. Drilling and sampling indicate that this contamination extends to depths of at least 68 feet below the bedrock ground surface. The southeast corner of the landfill represents a reservoir of PCBs that is potentially mobile, and numerous hydrologic tests show this area to be in direct hydraulic connection to the ICS. The PCBs present in the ICS spring water are likely associated with groundwater drainage originating in, or near, the southeast corner of the landfill.

The hydrologic tests further indicate that ICS is the discharge point for an approximate 300 acre groundwater drainage basin. The spring flows in direct response to rainfall and infiltration to the groundwater system within this area. EPA analyzed spring flow records for a 917 day period from August 21, 2001, to February 24, 2004, and determined that the mean hourly spring flow rate was about 300 gpm. Although flow rates were as low as 10 gpm, peak flow rates during storm events were as high as 4,500 gpm. PCBs are present in the ICS discharge at all flow rates.

The Lemon Lane Landfill area occupies only about 11 acres of the 300 acre ICS drainage basin. Figure 10 is a delineation of the groundwater basin for ICS. Hydrologic tests since 1998 have not successfully demonstrated that PCBs in the karst bedrock can be effectively contained, removed, or treated by remedial action focused at the landfill. Hydrologic tests also have not identified any location between the landfill and ICS where the landfill groundwater drainage can be captured and the PCBs removed. EPA thus considers the capture of PCBs at any point, or points, within the karst drainage system upstream of ICS is unlikely based upon the information to date. EPA's approach is therefore to control PCBs released from the landfill by treating the discharge from ICS, the upstream point where it is feasible to capture the PCBs emerging from the groundwater system. In doing so, EPA recognizes that flow volume from the entire 300 acre ICS drainage basin must be treated to effectively remove PCBs from the 11 acre, or less, portion of the basin that contributes PCBs. As described in the Remedial Action Objectives Section, the objective of the groundwater operable unit is to reduce the amount of PCBs that are released into Clear Creek. In the development of the discharge/capture model by EPA, it was determined that spring water bypassing the 1,000 gpm water treatment plant occurs infrequently, and occurs mainly during large storm events. The water treatment plant became operational in May 2000 and the storage tanks for stormwater went into service in June 2001. From June 2001 to February 2006, large storms have only produced 61days in which water has bypassed the 1,000 gpm treatment plant. In addition, beginning January 3, 2005, the largest volume of water produced from storm events since the ICS plant became operational produced flows at ICS for 8 days greater than the 1,000 gpm. The volume of water produced in excess of the 1,000 gpm plant capacity during this period was 18,311,800 gallons. The volume of water from the storm event shows that 30.5 additional storage tanks (600,000 gallons of water storage for each tank) would have been required to prevent spring water from bypassing the 1,000 gpm treatment plant. Due to the infrequent and episodic nature of the PCB releases at ICS, the large quantities of dense nonaqueous phase liquids (DNAPL) deep in the rock near the landfill, and the volume of water requiring treatment, the EPA is granting a TI waiver of NPDES substantive requirements for spring water which is not treated within the existing 1,000 gpm treatment plant.

The TI waiver applies to all the alternatives for the water operable unit. The specific ARARs being waived pursuant to CERCLA Section 121(d)(4)(C) on the basis of their technical impracticability from an engineering perspective are discussed in the Evaluation Criteria for Superfund Remedial Alternatives, Compliance with ARARs section.

The following ARARs will be waived for water not treated within the existing 1,000 gpm treatment plant:

- 327 IAC 2-1-6 Table 1
- 327 IAC 5-2-8 (10), (11), (12), (13) (14)
- 327 IAC 5-2-11 (a)(1), (2), (3), (4), (5)(C), (d), (e), (f), (g), (h)
- 327 IAC 5-2-11.1 (a), (b), (d), (f), (g), (h)

As result of this TI waiver, no discharge criteria will be given to spring water that is not treated by the 1,000 gpm treatment plant.

2. Fugitive Dust Requirements

Under 326 IAC 6-4-2, the State of Indiana has promulgated emission limits for "fugitive dust," i.e., particulate matter that escapes beyond the boundaries of the Site. These emission limits are relevant and appropriate with respect to dust resulting from the excavation of the ICS emergence, the swallowhole, and the Quarry Springs area. Likewise, the emission limits are relevant and appropriate with respect to on-site construction for the expansion of the water treatment facilities, including the installation of Modification A and B.

Under 326 IAC 6-4-4, the State of Indiana has prohibited any vehicle from driving on any public right of way unless the vehicle has been so constructed as to prevent its contents from escaping and forming fugitive dust. This requirement is relevant and appropriate not only with regard to the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area, but also for all the construction activities contemplated under the water operable unit.

b. Chemical-specific ARARs

1. 329 IAC 4.1-4 Requirements for storage and disposal of PCB wastes

Under 329 IAC 4.1-4, any sludge, soil, or other material generated by a water treatment facility or excavation of on-site material must be managed as PCB remediation waste in accordance with 40 CFR § 761.61. This requirement is relevant and appropriate with respect to PCB-contaminated soil/sediment generated by the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area and the alternatives for the water operable unit. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility.

2. 329 IAC 3.1 Universal Waste Rule

Under 329 IAC 3.1, all wastes generated by remediation activities must be analyzed to determine whether they meet the characteristics of hazardous waste. If they meet these characteristics, then they must be disposed of in an approved RCRA permitted facility in accordance with 40 C.F.R. §§ 260-280. This requirement is relevant and appropriate with respect to waste generated by the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area or by the construction of the water capture and treatment facilities. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility

3. 329 IAC 10 Solid Waste Land Disposal Facilities

Under 329 IAC 10, all wastes determined to be non-hazardous must be disposed of in a facility permitted to accept such waste. This requirement is relevant and appropriate with respect to waste generated by the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area or by the expansion of the water treatment facility, including

Modification A and B. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility.

4. 326 IAC 2-4.1 Major Sources of Hazardous Air Pollutants

Under 326 IAC 2-4.1, any owner or operator who constructs a major source of hazardous air pollutants (HAP) shall comply with the requirements of this section. PCBs are a HAP. Thus, this section is relevant and appropriate to the extent that the selected remedy would involve the construction of a major source of HAP. Under 40 C.F.R. § 63.41, the term "construct a major source" means to fabricate, install or erect a new process or production unit which emits or has the potential to emit 10 tons per year of any HAP. EPA does not anticipate that any of the proposed remedies would meet this threshold limit.

5. 326 IAC 2-5.1-3(a)(1)(D) Permits for New HAP Source

Under 326 IAC 2-5.1-3(a)(1)(D), a source of HAP that has the potential to emit ten tons per year of HAP must apply for a construction and operating permit. A source with lower emissions is exempt. To the extent that any of the proposed remedies would have the potential to emit ten tons per year of HAP, the remedy must comply with the substantive requirements of a permit, although no permit would be issued for the site.

6. 326 IAC 2-5.1-2(a)(1)(A) Registrations

Under 326 IAC 2-5.1-2(a)(1)(A), a source of HAP that has the potential to produce five tons per year of either particulate matter or particulate matter less than 10 microns in size, must apply for a registration. A source with lower emissions is exempt. To the extent that any of the proposed remedies have the potential to meet or exceed this threshold limit, the remedy must comply with the substantive requirements of the registration rule, although registration will not be required for the site. EPA does not anticipate that any of the proposed remedies will meet this threshold.

To be protective of human health and the environment, each alternative described within this ROD requires use or access restrictions to prevent residential development in the ICS emergence area, the swallowhole area, and the Quarry Springs area. Use restrictions or access restrictions will be implemented through the use of institutional controls. Institutional controls are administrative or legal constraints that minimize the potential for exposure to contamination by limiting land or resource use. Specific actions taken at sites to restrict access or use could include: Governmental Controls - such as zoning restrictions or ordinances; Proprietary Controls - such as easements or covenants; Enforcement Tools - such as consent decrees or administrative orders; and Informational Devices- such as deed notices or state registries. Several types of access or use restrictions employed simultaneously can increase the effectiveness of institutional controls.

The goal of these institutional controls is to prevent residential development in the ICS emergence area, the swallowhole area, and the Quarry Springs area.

There will be a program of Operation, Monitoring and & Maintenance, and this will include routine inspection. It is anticipated that institutional controls will be relatively simple to develop, likely through a layered approach, including: proprietary controls (easements and/or covenants); deed restrictions; and enforcement tools (AOCs and/or consent decrees), which will ensure the long-term reliability of the controls.

CBS may to continue the karst conduit study near the Lemon Lane Landfill. The investigation will focus on ways to reduce the cost of the operation and maintenance of the ICS water treatment plant. If the investigation determines that improvement to the final remedy is possible, EPA will put forth another Proposed Plan for public comment.

Sediment Operable Unit

The release of PCBs from Lemon Lane Landfill has contaminated sediment with PCBs at the ICS emergence, swallowhole area, Quarry Springs area and Clear Creek. Evaluating the sampling data described previously shows that the PCBs should be removed from soils and sediments at the ICS emergence, the swallowhole area, and the Quarry Springs area to reduce unacceptable risk. A cleanup criteria of less than 1 ppm PCBs will be required in any drainage areas and 5 ppm PCBs on average, with a maximum of 10 ppm PCBs in any grid for the other areas not used for drainage.

In its comments, CBS argues that, in addition to considering sediment removal in the area of the swallowhole, EPA must also consider a "no action" alternative. EPA disagrees. Under 40 C.F.R. § 300.430(f)(1)(i)(A), an remedial alternative must meet threshold requirements to be eligible for selection. Specifically, the remedial alternative must be protective of human health and the environment and must be in compliance with ARARs. The "no action" alternative proposed by CBS meets neither of these threshold criteria, and hence, it is not eligible for selection. First, the PCB concentrations at the ICS emergence, swallowhole and Quarry Springs area show unacceptable levels of PCBs based upon the risk assessments, with some areas greater than 50 ppm. Also, the effluent from the water treatment plant travels through the swallowhole and Quarry Springs area and transfers PCB contamination downstream due to the high concentrations of PCBs in those areas.

The estimated volume of contaminated sediment in both drainage areas and non-drainage areas at the ICS emergence, the swallowhole area, and Quarry Springs area is estimated to be 3,000 cubic yards. Additional sampling to finalize the volumes along with the exact location of the drainage ways will be completed in the design phase.

The PCB contaminated material will be disposed of in an off-site permitted landfill. It is assumed that 25% of the PCB contaminated sediment/soil is contaminated at levels greater than or equal to 50 ppm PCBs and this material will require disposal in a chemical waste landfill. PCB material contaminated at levels less than 50 ppm can be disposed of in a special waste landfill. The estimated cost to remediate the ICS emergence, the swallowhole area, and the Quarry Springs area is $1,183,613.

To evaluate the PCB contaminated sediment in Clear Creek, a concept called the surface weighted average concentration (SWAC) was developed. The SWAC was calculated for both the top three inches of sediment and top six inches of sediment. The SWAC is defined as the average PCB concentration of estimated values that are in the top 3 inches and 6 inches of sediment. PCB concentrations from the sediment sampling events were used and interpolated (estimated) using a conservative and aggressive scenarios. In upper north Clear Creek, the SWAC for 0 to 3 inches ranged from 0.134 ppm PCBs to 0.136 ppm PCBs. Lower north Clear Creek SWAC ranged from 0.184 to 0.193. For south Clear Creek, which is the area where most of the sediment in Clear Creek is located, the SWAC ranged from 0.62 ppm PCBs to 0.66 ppm PCBs. In comparison, the SWAC for 0 to 6 inches in south Clear Creek is very similar to the 0 to 3 inch values at 0.634 ppm PCBs to 0.679 ppm PCBs.

In addition to using the SWAC as an evaluation tool, the PCB sampling and sediment thickness results were used to estimate the volume of contaminated sediment. Once the volume was estimated, a model was developed to simulate the removal of PCBs greater than 1 ppm and 5 ppm for a number of different sediment depths. The results show volume removed estimates, pre-remediation PCB values, and post-remediation PCB values by depth. These results are summarized in the Table 6 below:

Table 6 - Simulated Post Remediation Concentrations

Remediation of PCBs > 1 ppm				
Depth in Clear Creek (in)	Volume Removed (m^3)	Pre-max conc. (ppm)	Pre-mean conc. (ppm)	Post mean conc. (ppm)
0-3	970	4.9	0.615	0.306
3-6	1,973	4.8	1.04	0.40
6-12	2,680	2.7	1.04	0.43
12-31	4,953	8.1	2.9	0.46

Remediation of PCBs > 5 ppm				
Depth in Clear Creek (in)	Volume Removed (m^3)	Pre-max conc. (ppm)	Pre-mean conc. (ppm)	Post mean conc. (ppm)
0-3	0	4.9	0.6	0.56
3-6	0	4.8	1.04	1.1
6-12	0	2.7	1.04	1.04
12-31	2,714	8.1	2.9	1.6

The results show that the removal of sediment greater than 1 ppm PCBs, particularly at the 0 to 3 inches and 3 to 6 inches of sediment provides little benefit. Using this information and the calculation of the SWAC, removing sediment will not greatly improve the PCB concentrations in fish since the PCB contamination levels in sediment are already low. Therefore, no sediment removal will be implemented in Clear Creek.

Expected Outcomes of Each Alternative

EPA expects an improvement of PCB concentrations in fish within Clear Creek with the implementation of each groundwater operable unit remedy. Since the startup of the 1,000 gpm treatment plant in May 2000, the fish PCB concentrations in Clear Creek have decreased approximately 80% at Allen Street. Farther downstream in Clear Creek PCB concentrations in fish have not decreased, but with the implementation of the sediment cleanup and continued treatment of PCB contaminated water from ICS, Quarry Springs and Rinker Spring are expected to reduce PCB concentrations over time.

COMPARATIVE ANALYSIS OF ALTERNATIVES

The EPA uses nine criteria to evaluate the remedial alternatives against each other to determine the most appropriate remedy for the site. Each alternative is compared to the other to determine the best balance of the nine criteria. The discussion below is a description of comparative analysis and Table 7 provides a summary of the comparison.

Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, for controlled, through treatment, engineering controls, and/or institutional controls.

All four of the alternatives evaluated for the water operable unit are protective of human health and the environment. Alternative 3 (storage tank overflow treatment) is the most protective because it treats most of the water through a storage tank overflow treatment system. In descending order of protectiveness are Alternative 2 (increase treatment capacity to 2,000 gpm), then Alternative 4 (double stormwater storage) and Alternative 1 (no change in treatment plant treatment plant capacity) would be the order of protectiveness. The order is based upon the amount of ICS water treated and the percentage of PCB mass removed from ICS as described in the Summary of Alternatives Section.

In the sediment operable unit, the remediation of the ICS emergence, the swallowhole area, and Quarry Springs area to a 1 ppm PCB standard in drainage ways and 5 ppm PCB on average in non-drainage ways is protective of human health and the environment. These areas could be developed for industrial or commercial reuse.

Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and NCP Section 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs", unless such ARARs are waived under CERCLA section 121(d)(4).

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those State standards that are identified by a State in a timely manner and that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent that Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking waiver.

The water and sediment operable units contemplated for the site are subject to two types of ARARs. First, action-specific ARARs set forth requirements on how certain actions must be performed at the site. Second, chemical-specific ARARs set forth numeric values or methodologies for the handling of certain hazardous substances.

The water operable unit remedial alternatives requires the expansion and operation of an on-site water treatment plant. This plant will not need to obtain a NPDES permit because on-site remedial actions are specifically exempt from such administrative requirements under Section 121(e) of CERCLA, 42 U.S.C. §96219(e). Nevertheless, certain regulations enacted by the State of Indiana under its federally-approved NPDES program are relevant and appropriate to discharges from the plant. In the Common Elements and Distinguishing Features of Each Alternative section, the ARARs that are required to be met are listed. In addition, EPA is implementing a TI waiver pursuant to CERCLA Section 121 (d)(4)(C) for certain ARARs that would otherwise apply to water that is not treated by the 1,000 gpm treatment plant. Due to the high concentrations of PCB oil in the rock that has been found at depths of up to 68 feet near the Lemon Lane Landfill and the infrequent nature of storm events that bypass the 1,000 gpm treatment plant, a TI waiver from an engineering perspective is justified. It is technically impracticable from an engineering standpoint to have a large water treatment plant with multiple process units (like those in the 1,000 gpm system), which would remain idle much of the time. The following ARARs will be waived for water not treated within the 1,000 gpm treatment plant:

- 327 IAC 2-1-6 Table 1
- 327 IAC 5-2-8 (10), (11), (12), (13) (14)
- 327 IAC 5-2-11 (a)(1), (2), (3), (4), (5)(C), (d), (e), (f), (g), (h)
- 327 IAC 5-2-11.1 (a), (b), (d), (f), (g), (h)

As result of this TI waiver, no discharge criteria will be given to spring water that is not treated by the 1,000 gpm treatment plant.

All ARARs will be met, excluding the ARARs associated with the TI waiver.

Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

Evaluating the alternatives for the water operable unit shows that Alternative 3 would have the most long-term effectiveness, because it treats the most water compared to the other alternatives and provides the most PCB mass reduction in the long-term. Ranking the alternatives in descending order of effectiveness after Alternative 3 results in Alternative 2, then Alternative 4, and Alternative 1 as the most effective in the long-term.

By cleaning up sediment/soils to 1 ppm PCBs in drainage ways and 5 ppm PCBs in non-drainage areas, PCBs associated with these sources will not migrate downstream into Clear Creek. The residual risk will be acceptable for industrial/commercial development. With the installation of a new effluent line, future migration will be further eliminated because water will not come into contact with the area.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy

Evaluating each alternative with respect to the reduction of toxicity, mobility, or volume of contaminants through treatment results in Alternative 3 as the best alternative, because it treats nearly 100% of the water from ICS and removes approximately 99% of the PCB mass from ICS. Alternative 2 at 98% of the ICS flow treated and 92% of the ICS PCB mass removed would be the next best alternative. Alternative 4 and Alternative 1 are the least effective in treating PCB flow and mass from ICS. Alternative 4 treats approximately 93% of the flow and 78% of the PCB mass from ICS and Alternative 1 treats 91% of the flow and 74% of the PCB mass from ICS. Alternative 3 will produce the most treatment residuals, but the carbon from the water treatment plant residuals will be managed in accordance with the Resource Conservation Recovery Act.

Remediating the sediment and soils at the ICS emergence, the swallowhole area, and the Quarry Springs area to 1 ppm in drainage areas and 5 ppm in non-drainage areas will mitigate the further migration of PCBs into Clear Creek. The PCB contaminated material greater than 50 ppm will be disposed of off-site in a landfill permitted to accept PCBs greater than 50 ppm. Material less than 50 ppm will also be disposed of off-site in a permitted landfill. The off-site disposal will not reduce the toxicity, mobility or volume through treatment since no treatment will occur at the landfill. Based upon the small volume of material and past activities implemented for contaminated soil/sediment, treatment was not considered

<u>Short-Term Effectiveness</u>

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

All four alternatives for the water operable unit can be implemented. Standard construction methods can be used and the short-term risk to construction workers and potential contact with contaminated soils and groundwater will be eliminated through engineering controls and the implementation of health and safety protocols. The ICS emergence, the swallowhole area, and the Quarry Springs area will be addressed first, then the installation of the new effluent line. The new effluent line will change the current conditions and the study of the flow of Quarry B Spring and Rinker Spring will be completed before determining what the final flow rates are for the two springs. The sediment/soil excavation at ICS emergence, the swallowhole area, and the Quarry Springs area will be monitored to ensure that the surrounding community and workers are protected from PCBs either through fugitive dust or volatilization.

The water treatment system will require operation and maintenance for an estimated 30 years or until the springs reach acceptable levels of PCBs so that the treatment system can be shut down.

<u>Implementability</u>

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

The four alternatives for the water operable unit can all be implemented. The necessary equipment is available and the ability to construct and operate the technology is common practice. The proposed excavation activities also can be implemented and will not pose unacceptable problems or risk.

Cost

To calculate the cost for each alternative, a 7% discount rate was used along with a 2% inflation rate. Present worth calculations were completed. In descending order of cost are Alternative 2, Alternative 3, Alternative 4, and Alternative 1.

The estimated cost to remediate sediment/soil at the ICS emergence, the swallowhole area, and the Quarry Springs area is $1,183,613.

State/Support Agency Acceptance

The State of Indiana along with the City of Bloomington and Monroe County support the implementation of Alternative 3 and completion of the soil/sediment cleanup at the ICS emergence, swallowhole and Quarry Springs area.

Community Acceptance

The public comments are addressed in the attached Responsiveness Summary. A few commenters submitted a large volume of comments not supporting Alternative 3 and recommending a complete excavation remedy. CBS submitted a large volume of comments stating that No Action was the appropriate remedy.

PRINCIPAL THREAT WASTES

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site whenever practicable (NCP 300.430(a)(1)(iii)(A). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source material that generally can be reliably contained and that would present only a low risk in the event of exposure.

During the source control excavation and during CBS's conduit study investigation, oil containing high concentrations of PCBs was found in bedrock as deep as 70 feet below ground surface. CBS attempted to pump the oil at a number of locations without success. Due to this residual PCB oil within rock and the karst geology, which is a source of the PCBs that emerge at ICS, a TI Waiver has been granted for the ARARs that would otherwise apply to the water not treated by the 1,000 gpm water treatment plant. The residual PCB contaminated oil in bedrock is producing the high concentrations of PCBs at ICS during storm events. The groundwater alternatives will address the residual PCB oil through treatment of ICS spring water. CBS has stated that it may continue to evaluate the location of the residual PCB oil to determine if operation and maintenance costs can be reduced over time.

SELECTED REMEDY

Groundwater Operable Unit

EPA selects Alternative 3 (Continue to Operate the Current 1,000 gpm Treatment Plant and Capture and Treat the Overflow from the Two Existing Storage Tanks and Implement Modification A and B) to address the continuing release of PCBs from ICS, Quarry Springs and Rinker Spring. Alternative 3 is the best alternative for overall protection of human health and the environment, long-term effectiveness and permanence, reduction of toxicity, mobility, and volume through treatment. In addition, the alternative can be implemented and is cost effective. Table 7 is a summary of the comparative analysis of the alternatives.

The storage tank overflow system will treat 5,000 gpm and when combined with the current 1,000 gpm system will be able to address a 25-year, 6-hour storm event. Alternative 3 treats nearly 100% of ICS flow and approximately 99% of the PCB mass released from ICS. The storage tank overflow system uses eight Calgon Model 12 or equivalent carbon adsorption vessels, each with 20,000 pounds of granular activated carbon. The vessels will have backwash capability to remove solids that build up within the vessels. The storage tank overflow system conceptual design will be based upon a completed treatability study and is expected to remove 95% of the PCB mass. Figure 12 shows an approach for the vessels but, during the design phase, it may be determined that a different system may be an improvement to the eight vessels proposed and the storage tank overflow treatment system may be modified.

Alternative 3 will meet the RAO's through reducing the PCB mass released from the springs associated with the Lemon Lane Landfill. Alternative 3 is expected to remove 99% of the PCB mass released from ICS and the treatment plant will continue to operate until water from the ICS emergence is less than 0.3 ppb PCBs for a 12-month period. An alternative shut-off criteria may be proposed and, if EPA determines that the alternative shut-off criteria provides a standard that is protective of human health and the environment, then the shut-off criteria identified in this decision document may be modified consistent with the substantive and procedural requirements of CERCLA and the NCP.

The capital cost for Alternative 3 is $2,223,000 with an annual operation and maintenance cost of $452,000. Using a 7% discount rate and 2% inflation rate, the present worth cost is $9,112,000. Table 8 is a detailed breakdown of capital costs, operation and maintenance costs and present worth costs.

Sediment Operable Unit

Consistent with the other soil and sediment cleanups for PCBs associated with the Westinghouse capacitor plant, EPA is selecting excavation and off-site disposal in a permitted landfill for contaminated sediment and soil at the ICS emergence, swallowhole and Quarry Springs area. A cleanup criteria of less than 1 ppm PCBs will be required in any drainage areas and 5 ppm PCBs on average, with a maximum of 10 ppm PCBs in any grid for the other areas not used for drainage.

Based upon sampling to date, the estimated volume of contaminated sediment in both drainage areas and non-drainage areas at the ICS emergence, the swallowhole area, and Quarry Springs area is approximately 3,000 cubic yards. For costing purposes, it has been assumed that 25% of the soils/sediment are contaminated at levels of greater than 50 ppm PCBs, which will require disposal in a chemical waste landfill permitted to accept PCBs greater than 50 ppm. The estimated cost to remediate the ICS emergence, the swallowhole area, and the Quarry Springs area is $1,183,613. Additional sampling to finalize the volumes along with the exact location of the drainage ways will be completed in the design phase.

Completing the cleanup in the swallowhole and Quarry Springs area along with installing Modification B will help to reduce PCB concentrations downstream in Clear Creek. As described previously, clean effluent from the ICS water treatment plant leaves the facility and travels through the swallowhole and Quarry Springs area which are currently contaminated with PCBs. Low levels of PCBs are transferred downstream by the effluent. This transfer mechanism will be eliminated with the remediation of the soils and sediments along with installation of the new effluent line. Deed restrictions will be placed on the ICS emergence, swallowhole and Quarry Springs area to prevent obstructing the drainage way.

STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, EPA must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

Protection of Human Health and the Environment

The Selected Remedy, Alternative 3, will protect human health and the environment through the treatment of PCB contaminated water by collecting and treating spring water from ICS, Quarry Springs and Rinker Spring. The soil/sediment remediation of the ICS emergence, swallowhole and Quarry Springs area will help to reduce PCB levels downstream in Clear Creek. The release of PCBs into Clear Creek will be reduced through the implementation of the Selected Remedy and over time, the risk levels should improve toward reaching the 1 in 1,000,000 excess cancer risk and a Hazard Index of less than 1. There are no short-term threats associated with the Selected Remedy that cannot be readily controlled and no cross-media impacts are expected from the Selected Remedy.

Compliance with Applicable or Relevant and Appropriate Requirements

The Selected Remedies for the groundwater operable unit and sediment operable unit will meet the respective ARARs and a TI waiver has been granted for water treated by the storage tank overflow treatment system. A list of ARARs are presented below:

Action Specific ARARs

1. NPDES Requirements

The water operable unit remedial alternatives requires the expansion and operation of an on-site water treatment plant. This plant will not need to obtain a National Pollutant Discharge Elimination System (NPDES) permit because on-site remedial actions are specifically exempt from such administrative requirements under Section 121(e) of CERCLA, 42 U.S.C. §96219(e). Nevertheless, certain regulations enacted by the State of Indiana under its federally-approved NPDES program are relevant and appropriate to discharges from the plant.

Specifically, the plant is subject to the following action-specific ARARs:

- Surface Water Quality Criteria for Specific Substances - 327 IAC 2-1-6, Table 1
- Conditions applicable to all permits - 327 IAC 5-2-8 (3), (7), (8), (9), (10), (11), (12), (13), (14)
- Considerations in the calculation and specification of effluent limitations - 327 IAC 5-2-11 (a) (1), (2), (3), (4), (5)(C); (d), (e), (f), (g), (h)
- Establishment of water quality-based effluent limitations for dischargers not discharging water to within the Great Lakes system - 327 IAC 5-2-11.1 (a), (d), (f), (g), (h)
- Applicability of Best Management Practices - 327 IAC 5-9-2 (a), (c), (d), (e), (i), (j)
- Monitoring - 327 IAC 5-2-13 (a), (c), (d), (e), (f)

- Permit modification, revocation and reissuance, and termination - 5-2-16 (c)(2), (d)(2)

As noted previously, the State of Indiana has stated in correspondence that it typically sets an effluent limit of 0.3 ppb for PCBs discharged by treatment plants into waters other than the Great Lakes System. The State may establish effluent limits for additional constituents if sampling data provided during the remedial design stage indicates the presence of other contaminants at such levels requiring the establishment of effluent limits. If appropriate, the State of Indiana will determine effluent limits for such contaminants.

EPA is implementing a TI waiver pursuant to CERCLA Section 121 (d)(4)(C) for water that is not treated by the 1,000 gpm treatment plant. Due to the high concentrations of PCB oil in the rock at depths greater than 68 feet near the Lemon Lane Landfill and the infrequent nature of storm events that bypass the 1,000 gpm treatment plant, a TI waiver from an engineering perspective is justified. It is technically impracticable from an engineering standpoint to have a large water treatment plant with multiple process units (like those in the 1,000 gpm system), which would remain idle much of the time. The following ARARs will be waived for water not treated within the 1,000 gpm treatment plant:

- 327 IAC 2-1-6 Table 1
- 327 IAC 5-2-8 (10), (11), (12), (13) (14)
- 327 IAC 5-2-11 (a)(1), (2), (3), (4), (5)(C), (c)(2), (d), (e), (f), (g), (h)
- 327 IAC 5-2-11.1 (a), (b), (d), (f), (g), (h)

As result of this TI waiver, no discharge criteria will be given to spring water that is not treated by the 1,000 gpm treatment plant.

2. Fugitive Dust Requirements

Under 326 IAC 6-4-2, the State of Indiana has promulgated emission limits for fugitive dust, i.e., particulate matter that escapes beyond the boundaries of the Site. These emission limits are relevant and appropriate with respect to dust resulting from the excavation of the ICS emergence, the swallowhole, and the Quarry Springs area. Likewise, the emission limits are relevant and appropriate with respect to on-site construction for the expansion of the water treatment facilities, including the installation of Modifications A and B.

Under 326 IAC 6-4-4, the State of Indiana has prohibited any vehicle from driving on any public right of way unless the vehicle has been so constructed as to prevent its contents from escaping and forming fugitive dust. This requirement is relevant and appropriate not only with regard to the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area, but also for all the construction activities contemplated under the water operable unit.

b. Chemical-specific ARARs

1. 329 IAC 4.1-4 Requirements for storage and disposal of PCB wastes

Under 329 IAC 4.1-4, any sludge, soil, or other material generated by a water treatment facility or excavation of on-site material must be managed as PCB remediation waste in accordance with 40 CFR § 761.61. This requirement is relevant and appropriate with respect to PCB-contaminated soil/sediment generated by the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area and the alternatives for the water operable unit. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility.

2. 329 IAC 3.1 Universal Waste Rule

Under 329 IAC 3.1, all wastes generated by remediation activities must be analyzed to determine whether they meet the characteristics of hazardous waste. If they meet these characteristics, then they must be disposed of in an approved RCRA permitted facility in accordance with 40 C.F.R. §§ 260-280. This requirement is relevant and appropriate with respect to waste generated by the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area or by the construction of the water capture and treatment facilities. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility

3. 329 IAC 10 Solid Waste Land Disposal Facilities

Under 329 IAC 10, all wastes determined to be non-hazardous must be disposed of in a facility permitted to accept such waste. This requirement is relevant and appropriate with respect to waste generated by the excavation of the ICS emergence, the swallowhole area, and the Quarry Springs area or by the expansion of the water treatment facility, including Modification A and B. Likewise, this requirement is relevant and appropriate with respect to PCB-contaminated sludge generated by the water treatment facility.

4. 326 IAC 2-4.1 Major Sources of Hazardous Air Pollutants

Under 326 IAC 2-4.1, any owner or operator who constructs a major source of hazardous air pollutants (HAP) shall comply with the requirements of this section. PCBs are a HAP. Thus, this section is relevant and appropriate to the extent that the selected remedy would involve the construction of a major source of HAP. Under 40 C.F.R. § 63.41, the term "construct a major source" means to fabricate, install or erect a new process or production unit which emits or has the potential to emit 10 tons per year of any HAP. EPA does not anticipate that any of the proposed remedies would meet this threshold limit.

5. 326 IAC 2-5.1-3(a)(1)(D) Permits for New HAP Source

Under 326 IAC 2-5.1-3(a)(1)(D), a source of HAP that has the potential to emit ten tons per year of HAP must apply for a construction and operating permit. A Source with lower emissions is exempt. To the extent that any of the proposed remedies would have the potential to emit ten tons per year of HAP, the remedy must comply with the substantive requirements of a permit, although no permit would be issued for the site.

6. 326 IAC 2-5.1-2(a)(1)(A) Registrations

Under 326 IAC 2-5.1-2(a)(1)(A), a source of HAP that has the potential to produce five tons per year of either particulate matter or particulate matter less than 10 microns in size, must apply for a registration. A source with lower emissions is exempt. To the extent that any of the proposed remedies have the potential to meet or exceed this threshold limit, the remedy must comply with the substantive requirements of the registration rule, although registration will not be required for the site. EPA does not anticipate that any of the proposed remedies will meet this threshold.

Cost-Effectiveness

The Selected Remedy is cost-effective and represents a reasonable value for the money spent. In making this determination, the following definition was used. "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP 300.430.(f)(1)(ii)(D)). This was accomplished by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence this alternative represents a reasonable value for the money to be spent.

The capital cost for Alternative 3 for the groundwater operable unit is $2,223,000 with $452,000 per year estimated to be operation and maintenance costs. Calculating a net present value using a 7% discount rate shows a cost of $9,112,000. The cost for the sediment operable unit is $1,183,613.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the Selected Remedy for the groundwater operable unit represents the maximum extent to which permanent solutions and treatment technologies can be used in a practicable manner at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering State and community acceptance.

The Selected Remedy treats PCB contaminated spring water prior to discharge to Clear Creek. The Selected Remedy satisfies the criteria for long-term effectiveness through the collection and treatment of spring water. The Selected Remedy does not present short-term risks and the technology to implement the remedy is not unusual. The remediation of soils/sediment at the ICS emergence, swallowhole and Quarry Springs area does not utilize permanent solutions and alternative treatment technologies for the estimated 3,000 cubic yards but is consistent with previous PCB cleanups in which off-site disposal was utilized.

Community Acceptance

Community acceptance is an important part of the remedy selection process and was assessed during the public comment period and associated public participation activities. Community acceptance of the preferred alternative identified in the Proposed Plan for the ROD Amendment was fully evaluated at the conclusion of the public comment period. The public comments are addressed in the attached Responsiveness Summary.

State/Support Agency Acceptance

The State of Indiana, the City of Bloomington, and Monroe County all support the implementation of Alternative 3.

Preference for Treatment as a Principal Element

By treating the contaminated spring water through adding 5,000 gpm to the current 1,000 gpm system, the Selected Remedy addresses the remaining threats posed at the site through the use of treatment technologies. By utilizing treatment for the groundwater operable unit, the statutory preference for remedies that employ treatment as a principal element is satisfied. Treatment is not employed for the sediment operable unit but the remedy is consistent with the other soil/sediment cleanups completed in Bloomington and the surrounding area.

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow unlimited use and unrestricted exposure, the Five-year Review requirements will continue. The first Five-Year Review was completed on June 23, 2005 and the next review is scheduled to be completed by June 2010.

DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

The Proposed Plan for the Lemon Lane Landfill Site was released for public comment on June 14, 2006. The Proposed Plan identified Alternative 3 as the Preferred Alternative for addressing the continuing release of PCBs from springs into Clear Creek and a soil/sediment cleanup at the ICS emergence, swallowhole and Quarry Springs area. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

Tables 7 – Comparative Analysis of Remedial Alternatives

Table 8 – Estimated Net Present Value Costs, Estimated Capital Costs, Annual Operation and Maintenance Costs

Table 7
Comparative Analysis of Remedial Alternatives
Bloomington, Indiana

Criteria	Alternative 1: No Further Action Maintain Exisitng Operation	Alternative 2: Increase Plant Treatment Capacity (2000 gpm)	Alternative 3: Overflow Capture / Passive Treatment Tank	Alternative 4: Increase Bulk Storage to 2.4 MGAL
OVERALL PROTECTION OF HUMAN HEALTH & THE ENVIRONMENT	**(+) → Increasing Protection → (++++)**			
Protection of Human Health	+	+++	++++	++
Ecological Protection	+	+++	++++	++
COMPLIANCE WITH ARARS	**(-) Does Not Meet; (+) Meets**			
Chemical-Specific ARARs	+	+	+	+
Location-Specific ARARs	+	+	+	+
Action-Specific ARARs	+	+	+	+
Other Criteria, Advisories, Guidance	+	+	+	+
LONG-TERM EFFECTIVENESS AND PERMANENCE	**(+)→ Increasing Effectiveness→(++++)**			
Magnitude of Residual Risk - Human Health	+	+++	++++	++
Magnitude of Residual Risk - Ecological	+	+++	++++	++
Adequacy and Reliability of Controls	+	+++	++++	++
REDUCTION OF TOXICITY, MOBILITY , AND VOLUME THROUGH TREATMENT	**(+) → Greater Reduction →(++++)**			
Treatment/Recycling Processes Utilized	+	+++	++++	++
Amount of Hazardous Materials Destroyed or Treated	+	+++	++++	++
Degree of Expected Reductions in Toxicity, Mobility or Volume	+	+++	++++	++
Irreversibility	+	+++	++++	++
Type and Quantity of [Process] Residuals	++++	++	+	+++
SHORT-TERM EFFECTIVENESS	**(+) → Increasing Effectiveness→ (++++)**			
Protection of Community and Workers During Remedial Actions	++++	++++	++++	++++
Environmental Impacts	++++	++++	++++	++++
Time Until Remedial Action Objectives are Achieved	++++	++++	++++	++++
IMPLEMENTABILITY	**(+) →Increasing Potential → (++++)**			
Ability to Construct and Operate the Technology	++++	++++	++++	++++
Reliability of the Technology	++++	+++	+++	+++
Ease of Undertaking Additional Remedial Actions, if Necessary	+	+++	++++	++
Ability to Monitor Effectiveness of the Remedy	++	+++	++++	++
Ability to Obtain Approvals from Other Agencies	+	+++	++++	++
Coordination with Other Agencies	++++	++++	++++	++++
Availability of Off-Site Treatment, Storage, and Disposal Services	++++	++++	++++	++++
Availability of Necessary Equipment and Specialists	++++	++++	++++	++++
Availability of Prospective Technologies	++++	++++	++++	++++
COST	*** Comparative Cost (without Mod A & B)**			
Capital	$968,000	$3,136,000	$2,223,000	$2,320,000
O&M	$386,000	$526,000	$452,000	$408,000
Present Worth	$6,851,000	$11,151,000	$9,112,000	$8,538,000

TABLE 8
ESTIMATED NET PRESENT VALUE COSTS
REMEDIAL ALTERNATIVE 3
TREATMENT OF STORAGE TANK OVERFLOW

PROJECT:	ICS
PROJECT NUMBER:	71261.01
DATE:	14-Sep-06

Input Data		Results	
Interest Rate (%):	7	NPV	($2,261,000)
Inflation Rate (%):	2		

Year	Investment	Expenses	Cash Flow	Discount Factor	Discounted Cash Flow
0	$1,255,000	$0	($1,255,000)	1.000	($1,255,000)
1	$0	$66,000	($66,000)	0.935	($61,682)
2	$0	$67,320	($67,320)	0.873	($58,800)
3	$0	$68,666	($68,666)	0.816	($56,052)
4	$0	$70,040	($70,040)	0.763	($53,433)
5	$0	$71,441	($71,441)	0.713	($50,936)
6	$0	$72,869	($72,869)	0.666	($48,556)
7	$0	$74,327	($74,327)	0.623	($46,287)
8	$0	$75,813	($75,813)	0.582	($44,124)
9	$0	$77,330	($77,330)	0.544	($42,062)
10	$0	$78,876	($78,876)	0.508	($40,097)
11	$0	$80,454	($80,454)	0.475	($38,223)
12	$0	$82,063	($82,063)	0.444	($36,437)
13	$0	$83,704	($83,704)	0.415	($34,734)
14	$0	$85,378	($85,378)	0.388	($33,111)
15	$0	$87,086	($87,086)	0.362	($31,564)
16	$0	$88,827	($88,827)	0.339	($30,089)
17	$0	$90,604	($90,604)	0.317	($28,683)
18	$0	$92,416	($92,416)	0.296	($27,343)
19	$0	$94,264	($94,264)	0.277	($26,065)
20	$0	$96,150	($96,150)	0.258	($24,847)
21	$0	$98,073	($98,073)	0.242	($23,686)
22	$0	$100,034	($100,034)	0.226	($22,579)
23	$0	$102,035	($102,035)	0.211	($21,524)
24	$0	$104,075	($104,075)	0.197	($20,518)
25	$0	$106,157	($106,157)	0.184	($19,559)
26	$0	$108,280	($108,280)	0.172	($18,645)
27	$0	$110,446	($110,446)	0.161	($17,774)
28	$0	$112,655	($112,655)	0.150	($16,943)
29	$0	$114,908	($114,908)	0.141	($16,152)
30	$0	$117,206	($117,206)	0.131	($15,397)
Totals:	$1,255,000	$2,677,493	($3,932,493)		($2,260,902)

TABLE 8
ESTIMATED CAPITAL COSTS
ALTERNATIVE 3
TREATMENT OF STORAGE TANK OVERFLOW

CLIENT:	ICS
PROJECT:	FS
PROJECT NUMBER:	71261
DATE:	14-Sep-06

SHIPPING FOR THIS PROJECT (%): (cost of shipping equipment to site as a percentage of total equipment cost)	5
CONTINGENCIES FOR THIS PROJECT (%): (contingencies based on total installed equipment cost)	15
ENGINEERING FOR THIS PROJECT (%): (estimate of engineering is based on total installed equipment cost)	10
CONSTRUCTION MANAGEMENT FOR THIS PROJECT (%): (estimate of construction management is based on total installed equipment cost)	5

GAC and GAC filter costs were obtained from Calgon Carbon. Building costs were obtained from Varco-Pruden.
Other costs presented in this estimate are based on vendor quotes or past experience.
Some unit costs may have been obtained from cost estimating references.

TABLE 8
ESTIMATED CAPITAL COSTS
ALTERNATIVE 3
TREATMENT OF STORAGE TANK OVERFLOW

ITEM #	WORK ITEM	UNIT	Estimated Quantity	Equipment Unit Price	Equipment Estimated Total Cost	Installation Unit Price	Installation Estimated Total Cost	Estimated Total Cost
(1).	GAC Feed Tank & Pad	EA	1	$12,000	$12,000	$10,000	$10,000	$22,000
(2).	Tank pads with foundation/footings	EA	8	$600	$4,800	$1,000	$8,000	$12,800
(3).	GAC treatment tank	EA	8	$57,500	$460,000	$1,500	$12,000	$472,000
(4).	Freight for tanks	EA	8	$0	$0	$4,000	$32,000	$32,000
(5).	First charge of GAC	EA	8	$15,000	$120,000	$200	$1,600	$121,600
(6).	Wastewater influent pipes from storage tank overflow including fittings	LF	300	$15	$4,500	$10	$3,000	$7,500
(7).	Wastewater effluent pipe to connect to NPDES outfall pipe	LF	360	$15	$5,400	$10	$3,600	$9,000
(8).	GAC Feed Pumps (2000 gpm)	ea	3	$9,000	$27,000	$2,800	$8,400	$35,400
(9).	Backwash influent pipe from backwash tank including fittings	LF	400	$15	$6,000	$10	$4,000	$10,000
(10).	Wastewater effluent flow meter	EA	1	$4,000	$4,000	$1,000	$1,000	$5,000
(11).	Influent flow meter	EA	2	$3,000	$6,000	$500	$1,000	$7,000
(12).	Electrical supply for heat trace	LS	1	$3,000	$3,000	$2,000	$2,000	$5,000
(13).	Pipe racks for elevated pipe	LS	1	$4,000	$4,000	$6,000	$6,000	$10,000
(14).	Bypass pipe including fittings	LF	200	$15	$3,000	$10	$2,000	$5,000
(15).	Valves for all pipe lines	LS	1	$10,000	$10,000	$2,500	$2,500	$12,500
(16).	Trenching/excavation/backfill for underground pipe	LF	380	$0	$0	$15	$5,700	$5,700
(17).	Heat trace and insulate influent	LF	60	$10	$600	$10	$600	$1,200
(18).	Provide access to tank for GAC change outs	LS	0	$2,000	$2,000	$2,000	$0	$0
(19).	Power, control & monitoring wiring with connections to existing PLC	LS	1	$13,000	$13,000	$13,000	$13,000	$26,000

TABLE 8
ESTIMATED CAPITAL COSTS
ALTERNATIVE 3
TREATMENT OF STORAGE TANK OVERFLOW

ITEM #	WORK ITEM	UNIT	Estimated Quantity	Equipment Unit Price	Equipment Estimated Total Cost	Installation Unit Price	Installation Estimated Total Cost	Estimated Total Cost
(20).	Health and Safety Plan	LS	1	$0	$0	$3,000	$3,000	$3,000
(21).	Startup and Shakedown	LS	1	$2,000	$2,000	$10,000	$10,000	$12,000
(22).	Meetings	EA	3	$1,000	$3,000	$1,000	$3,000	$6,000
(23).	Percent labor multiplier for enhanced PPE for work in contaminated zone	LS	1	$2,000	$2,000	$5,000	$5,000	$7,000
(24).	Pilot Testing	LS	1	$3,000	$3,000	$15,000	$15,000	$18,000
	TOTAL INSTALLED COST:				$695,300		$152,400	$845,700
			SHIPPING (5%):					$34,800
			MARKUP ON EQUIPMENT & INSTALLATION (10%):					$84,600
			ROUNDED SUBTOTAL:					**$965,000**
			ENGINEERING:					**$97,000**
			CONSTRUCTION MANAGEMENT:					**$48,000**
			CONTINGENCIES:					**$145,000**
			GRAND TOTAL:					**$1,255,000**

TABLE 8
ANNUAL OPERATION AND MAINTENANCE COSTS
REMEDIAL ALTERNATIVE 3
TREATMENT OF STORAGE TANK OVERFLOW

PROJECT: ICS
PROJECT NUMBER: 71261
DATE: 14-Sep-06

Item No.	O&M Cost Item	Units	No. of Units	Unit Cost	Estimated Cost
(1).	Electrical costs for backwash pumps (1200 gpm x 5 days/event x 4 events/yr)	Kw-hr	10,000	$0.08	$800
(2).	Electrical costs for GAC Feed Pumps (6000 gpm x 5 days/event x 4 events/yr)	Kw-hr	50,000	$0.08	$4,000
(3).	Electrical costs for heat trace	Kw-hr	30,000	$0.08	$2,400
(4).	Electrical for indoor/outdoor lights	Kw-hr	10,000	$0.08	$800
(5).	Labor for monitoring, records & change outs (2 hrs/wk.)	hr	104	$50	$5,200
(6).	GAC consumption rate (40,000 lbs/year) (2 filters/year)	lbs	40,000	$0.700	$28,000
(7).	Transportation & installation for GAC change outs (2 filters/year)	filter	2	$1,250	$2,500
(8).	Transportation & disposal of spent GAC ($2,600 per 20,000 lbs for transport & incineration assuming > 50 ppm PCBs)	filter	2	$2,600	$5,200
(9).	Analytical testing to support disposal options	filter	2	$1,000	$2,000
(10).	Equipment repair and replacement (instruments, pumps, building)	LS	1	$2,500	$2,500
(11).	inlet and outlet (2 samp ea/3 events/yr for TSS & PCBs)	samples	6	$250	$1,500
(12).	Performance sampling & analytical of	samples	3	$250	$750
(13).	Miscellaneous supplies	LS	1	$2,000	$2,000
(14).	Building maintenance	LS	1	$2,000	$2,000

Annual O&M subtotal	$59,650
General Consulting/ Project Management (5	$3,000
Contingencies (5%):	$3,000
Total estimated annual O&M cost:	$66,000